

THE BOOK OF BUGS

HARVEY SUTHERLAND



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BY

HARVEY SUTHERLAND



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THE BOOK OF BUGS.



CHAPTER I.

BY WAY OF AN INTRODUCTION.

Two friends of mine, Mr. Luke Colleran and Mr. Thomas Brady, were once discussing literary matters in my presence. Said Mr. Brady: "They's wan buck I wish't I had. 'Tis the Hish't'ry of the Wurruld."

"They's no such buck," declared Mr. Colleran with conviction.

"There is, thin," retorted Mr. Brady, "fur I seen it mesilf."

"Have done, Tom," rebuked Mr. Colleran. "Sure, ye're on'y tarkin' foolishness. Why, mon alive, the Hish't'ry of the Wurruld, av it was wrote down, av it was all wrote down in black an' white, 'twud make a buck,

why, 'twud make a buck the lin'th o' this table an' the hoi'th of it from the flure."

"It would not. Sure, amn't I tellin' ye I seen it? To me aunt's house it was. A black buck wit' pitchers in it. 'Twas about the common size o' bucks."

"'Twas not the rale Hith'ry of the Wurruld thin."

"It was."

Rather than have a fuss, Mr. Colleran passed the point at issue for the moment and went on to ask: "Well, sipposin' ye had it, Tom, sipposin' ye had it, what good wud it do ye?"

"Well, for wan thing," declared Mr. Brady, looking out of the window with a far-away glance, "I'd find out where was the cinther of the wurruld. 'Tis somewhere in Peru or Patagony, I disremember which. Wan or th' oother."

I have often thought since then how completely Mr. Brady's interest in books accorded with that of all other people. If it had been any of my put-in, I could have told him that where he sat at that moment was the center of the world, as it is for each one of us, and that one spot is the one we care most for. It is a most engaging topic of discussion for us at all times, and when we get going on it there's no stopping us. I myself possess a large fund of the most breathlessly exciting information, such as how positive I am in my likes and dislikes; if I like a thing, I like it, and if I don't like it, I don't like it at all. Then, too, I have a great memory for faces. If I see a man ten or fifteen times and become very intimate with him and I meet him six months or a year afterward and he comes up and holds out his hand and says: "Why, how do you do? Don't you remember me? I met you at So-and-so's," quick as a flash it all comes back to me. But I have a very poor memory for names. If I am

introduced to fifteen or twenty people at a time, it is very hard for me to remember which is which. It is a peculiarity that runs in our family. I am very fond of coffee, good coffee, that is. Deliver me from poor coffee. And another interesting thing about me is that I don't like to eat—I forget for the moment what it is that other people like to eat that I don't, but let that pass. Maybe it will come to me by and by, but if it doesn't it's no great matter, for I was only going to say that not only can I talk by the hour about myself, the center of the visible universe, the point from which the circle of the horizon is described, but about the other beings in the near neighborhood of that center; of what a 'cute thing my little girl said yesterday and about a dog I once had. Probably I would, if in my mind's eye I did not see you nervously crossing and uncrossing your legs and starting in four or five times, when you thought there was a chance to get a word in edgewise, to tell how you always have tea for breakfast and what your little boy said and about that parrot your Aunt Jane had.

The collection and comparison of facts, science, in a word, proceeds thus outwardly. First, we observe ourselves and what concerns us. Then other people attract our notice and we are interested in the ridiculous ways they have. Of all the absurd creatures on the face of the earth I think other people are the absurdest. Then observation extends to other places and even lands beyond sea, where folks behave still more nonsensically. The Chinese, for example, think that the magnetic needle points to the south, when anybody with any sense at all can see that it points straight to the north.

However, of late the world has become so shrunk together, as it were, that we have grown surfeited with books of travel. While they are undoubtedly of the same

vivid interest to the men that write them as my account of my partiality for coffee is to me, to the rest of us they are about as tiresome as your story about your always drinking tea for breakfast. There was hope for a while that we might get into communication with Mars, and thus have something to talk about after we had done with the weather, but that hope wilted when Mr. Tesla declared it to be a perfectly feasible undertaking, so we have turned to the creatures about us that we so modestly call "the lower animals."

Our acquaintance with these has progressed according to rule, from the center of the world outwardly. I suppose—not having been present, except potentially—that Primitive Man was interested first in those creatures that were good to eat. After that, I should think, he noticed the first animal, if not the only animal, that took Man at his own valuation, that came to him and said: "Resistance is useless against so resourceful an antagonist. Say, do you know, you are smarter than any of them? Let's you and me go into cahoots. Have you any cold meat about the house? Yes, sir, I was just saying this morning that there was no getting away from it, you were undoubtedly the smartest of the lot. Oh, anything will do, a bone or what scraps you happen to have."

I mean the dog. The cat's case was different. Notice how we naturally call a dog "he" and a cat "she." The dog is man's vassal; the cat is woman's client. The dog was overawed by man's prowess in the chase, and by associating with man became man's slave and lost his self-respect in his admiration for his master. If man caught, woman kept, and storehouses are famous mousing-grounds. It was woman coaxed the cat to leave the wild life and come live in a house and kill the mice. The cat thought it over and finally accepted the invitation, with

some reserves. She considers herself in no way beholden for her board and keep.

We admire the dog's intelligence, which means that we think his mind is very like ours. If dogs could spare their forelegs from running and could hold things with their paws, as a man can with his hands, and in addition had the right-shaped mouths for talking, I don't know but they would run Man a pretty close race for supremacy. We make a great deal of to-do over the dog's devotion, and really it is surprising, but it is a fact that the name of the only animal in creation that is truly and wholeheartedly our friend is the name we give to somebody that we loathe and detest. It is only the selfish and cruel-hearted person that we call "a cat." There is less contempt than fear in this epithet. Fear is a kind of respect.

Dogs, cats, horses, cows, sheep, and chickens—those are the animals we know best in these times, though our hunting days are not so far back of us but we have a speaking acquaintance with some other animals that are good to eat or else devour the animals that are good to eat. These latter we count our foes, but what little respect we can spare from ourselves goes to them and not to our friends. We are always glad that Congress had the sense to reject Benjamin Franklin's suggestion to make the turkey the national bird. That it is a beautiful creature and one peculiar to this country cannot take away the reproach of its being good to eat. Think how ashamed we should be to have to put the picture of a gobbler on condensed-milk cans and soap-boxes instead of a noble kind of buzzard with a ribbon in its mouth. There is something glorious about an eagle, for it steals chickens and is not fit to eat.

Out from the center of the earth, beyond birds and their cousins, the reptiles and the cold fishes, beyond even the

confines of red blood and bones, lie orders of life where our light is but darkness, and where the little that we know is multiplied a millionfold by what there is to know. The mammals of this world have been so assiduously ticketed and labeled that the whole scientific world was all of a twitter not long ago at the news that Sir Harry Johnson had discovered a new quadruped, the okapi. It seems to be a sort of variegated ass, and though there is no great scarcity of variegated asses, the discovery of a new kind was considered an event of such importance that the yellow journals exploited it largely, the animal having been tinted by nature with remarkable forethought and adaptation to the three-colored process for the illustrated Sunday supplements. Sir Harry had to go to Central Africa to find this unlisted four-legged beast, but if he had been looking for a six-legged beast that was equally unlisted he need only have gone to Central Park on a fine summer's day, and the chances are that his cyanide bottle would have been stocked with two or three creatures as pretty as the okapi and as absolutely unknown. Besides, he would have got home in time to dress for dinner.

I don't pretend to guess how many millions of species of insects are unnamed even. There is something about the word "million" that confuses me. A hundred or even a thousand I can form some sort of an idea of, but to me a million means only a terrible lot, something really painful in number, that makes me scowl and press my lips together and say, "M—m! Mercy!"

Well, there are probably several hundred times as many as that of species of insects that the scientific men haven't observed, to say nothing of us common people that can only say to a bug, "Your features are familiar, but I just can't quite speak your name."

To my notion the regular entomologists have been too anxious to collect beautiful butterflies that will mount well and make a pretty showing in their cabinets, but I am, like my friend Brady, more interested in the "cinther of the wurruld," that is to say, in the things that come near to me in my house and garden—creatures that I meet in the sugar-bucket and around the kitchen sink, that take a nip out of me, or ruin my winter overcoat—than I am in the beauteous creatures that wag their painted vans through the summer air. With such vulgar things as these collectors do not bother. I did my best to get a mounted specimen of the common clothes-moth in the museums of New York, Brooklyn, and Washington. A magazine editor was willing to take an article on that subject if he could illustrate it with striking and dramatic pictures. His idea was to have the ferocious moth represented in the act of swooping down on a man, biting a piece out of his trousers, and flying away with its booty in its beak. When I told him that the clothes-moth hadn't any beak, hadn't any mouth to bite with, he looked at me in such a funny way. If he hadn't been a magazine editor and so under heavy bonds to be dignified, he would have said: "Go wan! What are you givin' us?" But though he did not thus openly doubt my word, I could see that he had half a notion to back out then and there, and say that he was very sorry, but they already had several articles of a similar nature on hand. On publication, however, he managed to take the curse off, so to speak, by printing a picture of a moth with a proboscis as long as a watch-spring. I might deny in the letter-press till I was black in the face that moths had mouths, but he had cast an anchor to windward by means of the picture of the long tongue with which the moth sucks the honey out of a woolen blanket.

As I say, I did my best to get a mounted specimen of the common clothes-moth. They had them in the museums, too many of them, but none was mounted. The curators didn't know of anybody that collected Tineids. They had the *Thingumbobbius what'sitsnameii* from Southern Madagascar, but the common clothes-moth, no. Never heard of anybody mounting that.

Now in this book I am going to stick close to the center of the world. The *Thingumbobbius what'sitsnameii* may be very rare and costly, and in its habitat of Southern Madagascar may form a pleasing feature of the tropical landscape with its wings of flame, but it concerns me not half so much as the thing nearer home of which the poet has sung that it

“ . . . Has no wings at all,
But it gets there just the same.”

What shall we do when we find it under the pillows? That's what I want to know, and I am satisfied that all of my fellow-citizens are vitally interested in this topic and others germane.

Most of the time we forget that the advent of man upon the stage of life in increasing numbers and influence is recent, and completely disruptive of the order of things established for countless ages, and that all sorts of troubles come upon us by consequence. While our ancestors ran wild and naked it made little difference whether there was one more kind of animal or not, and in the slow progress of centuries what changes man effected in the face of nature were minor and evanescent, but the periods marked by the general coming into use of gunpowder and dynamite have wrought such sweeping changes that the world can never be the same as it was, it can never go on again in the same old way. For not only is the aspect of nature altered, but also the mind of

man. The balance of life must make wide oscillations before it finds again an equilibrium.

Forests have been cut away as never before, and the bared fields have been sown with crops of plants that have behind them, not the inherited strength of millions of years of adherence to one form, but the weakness of a thing of yesterday. What cultivated fruit or flower is to-day what it was a half century ago? The gooseberries in my grandmother's garden were of the size of peas and had stickers on them. The size of peas? What peas? You must know that ere you have a measure of comparison. Yet peas were once about of a bigness.

Driven from the forests that no longer exist, hordes upon hordes of insects turn to our gardens and our fields for sustenance. They swarm over everything and devour our food before our eyes. They find us almost as unable to combat them as the Huns found mediæval Europe. We have so abolished poisonous snakes that I do not believe I ever saw one out of captivity. Wolves and bears and catamounts we behold only pacing behind bars in the parks. Every boy whose father gives him a shot-gun bangs away at wild birds till there is none left to speak of, and how many thousand destructive insects a bird may destroy in a day our governmental entomologists are just now trying to find out. Millions upon millions of dollars would hardly pay for all the damage done to one food-crop in the year by six-legged depredators, and almost the only thing we do is to put up with it.

New kinds of insects preying upon food-stuffs are imported every year from foreign lands in commerce, which is now world-wide. New kinds of insects find our fruits and vegetables as appetizing and as nourishing as the forest growths so swiftly disappearing. Not only are we cursed in our fields, but in our basket and store. It is

estimated that if all the enemies of Hemiptera (bugs that suck with their beaks) should be destroyed at once, the whole world would be starving in a few weeks.

Not only is man himself annoyed and his crops devoured, but his cattle and his horses, sheep and domestic fowl are slain by the million every year by insects. It is not the lion that keeps South African veldts out of tilth, but a fly, far more difficult to exterminate. The lion kills only here and there a horse. The fly kills them all.

But insects do not only annoy man. They kill him, too. The war with Spain taught us many things, among them two that we but half believed before: that flies poison us with typhoid and mosquitoes with yellow fever. If we were really civilized we should exterminate these beasts as we have the rattlesnake and the copperhead, but being only just beginning to be civilized we retreat into strongholds fortified with wire gauze, where the invaders cannot reach us. Still, we are learning how to fight them, and some day people will realize how enormous are the benefits conferred upon us by the teacher, the Entomological Division of the United States Department of Agriculture. My share of the indebtedness due I cannot liquidate, but I can acknowledge it (and that is something), not only for the information it has afforded me in general, but also in particular for very excellent illustrations, many of which appear in this book. There is some mighty good reading in the reports of this Department. I recommend their careful perusal. Of course the authors of these documents cannot write so charmingly as I can, but they know a lot more. I am not sure but they have a little the best of it, at that.

It is a sad story, the devastations made by insects, but if, after having gone so far with me you feel inclined to

make the whole trip, I shall try to take as cheerful a view of life as is possible when you consider that in all the insect world we find not one single friend. Some insects like us, that is, like the taste of us, and some even become attached to us, but it is invariably the kind of attachment we are anxious to sever immediately. Some of them are fond of being where we are, but in every case it is "cup-board love" and no more. They are with us for what they can get from us. The bee is a beneficial insect because we rob its storehouse in such wise as really to benefit the race of bees, but man is always an alien. The silkworm is profitable after much the same fashion, but when these two are named the story of man's insect friends becomes very much like that of Jack-a-Nory and his brother. If any other six-leg is worth cultivating it is because it kills off other six-legs, and not because it is a lovable character in itself.

And yet, for all that, they are an interesting lot of folks. There is a pile of sense in them—not exactly our kind of sense perhaps, but the kind they need, and in sufficient quantity. Some of them, I should think, have quite as much gumption as—but what's the use of going into personalities? There is even a lot of human nature in them, which is not so surprising as you might think, seeing that we are all cut off the same bolt of goods, that is to say, Protoplasm.



THE PLAGUE OF FLIES.

THE sympathies of men in all ages have gone out to the Pharaoh of the Exodus in one of the deep afflictions that came upon him. Certainly he did deserve some punishment for the way he acted, hardening his heart and refusing to let that people go which other rulers since his day have been only too anxious to drive out; but somehow it has seemed a little too much that he should have been pestered so with flies. If he was a bald-headed man, his agony must have been something pitiable. However, perhaps it was not quite so bad as it seems. The "elasticity of the original Hebrew" is always to be counted upon in any difficult passage, and not only the Sepher Hajaschar and the Targum Yerushalmi,—with which every schoolboy is familiar,—but also the side-notes of the Authorized Version show that the words may quite as well be translated "mixtures of noxious beasts" as "swarms of flies." (If I were a statesman I should make it the rule of my life never to be interviewed in anything but the original Hebrew. Then whatever I said that did not happen to suit I could prove really meant something quite different.) So we might as well keep our sympathy to ourselves. It will very likely do us as much good as it will him.

I am afraid the original Hebrews were not very strong

on entomology. I remember I used to wonder what kind of bees they had in Samson's time that would make a hive in the carcass of the lion the strong man slew. No bees that ever I saw had any interest in carrion, but when I found out that robber-flies mimic the bumble-bees even to the extent of wearing pollen-baskets on their hind-legs, though these are of no use to the flies except as a disguise, a great light broke upon me. Robber-flies would have great business in the dead lion. As to the honey that Samson got and gave to his intended, that is a difficulty I do not feel competent to cope with.

Almost any modification of structure may be expected of the Diptera, that is to say, of the two-winged insects of which the fly is a type. They are the most highly specialized and variational of six-legged cattle. The deer-tick, for example, no one in his senses would think was a fly unless he were familiar with the difference in the make-up of flies and true ticks. Whether they throw off or bite off their wings is not known, but they haven't them. The bat-tick, which also is not a tick, but a fly, looks for all the world like a spider, so small is its body and so long its legs. A spider has four pairs of legs, though, instead of three.

Many of the fly family bring forth their young alive, and some have only one child at a time, but the most of them believe in the good old fashion of large families. Students of entomology being naturally interested in the *Thingumbobbius what'sitsnameii* of Southern Madagascar have not yet got around to the careful study of the common house-fly, and so cannot say what its domestic arrangements are, but it is estimated that if the first papa and mamma flies of the early spring could hold out to attend a family reunion of their direct descendants held in the latter part of August, upwards of two millions

of blood-kin would come to the picnic, not counting maggots in arms.

"Who'd you say that was?" we may imagine old Pap Fly asking.

"Why, that's Jinny's oldest boy."

"Jinny? What Jinny?"

"Why, Lizy's granddaughter."

"Lizy?"

"Yes, Lizy. She was Mose and Drusilly's girl. Don't you remember Mose? He was born away back in the latter part of July, I've heard say."

"No. No. I guess I don't ricollect him. I'm a-gittin' old. Old an' fergitful. It's turrable when you git 's old 's I be."

Fortunately for us, flies do not live much longer than a fortnight, for if they were long-lived and as prolific as now, man would soon be forced to look for some place where things were not quite so crowded, and the real estate advertising columns would be full of, "WHY FIGHT FLIES? Secure a Planet of Your Own on Easy Monthly Payments."

It is well to point out, however, that the saving clause, "it is estimated," corrects the 2,000,000 if that should happen to be, as Artemus Ward would say, "2 mutch." In the original Hebrew I believe the same word can be translated either "much" or "million." Scientific men are just like other people and hate just as much to have to answer, "I don't know," to a plain question. They have learned that "it is estimated" acts on the same principle as a boy's "over the left," and authorizes them to tell with impunity the most jaw-dropping, eye-bulging whoppers, causing the public to wag heads and cluck, "Tchk! Look at that now! That's what it is to have an education."

None, so far as I know, has undertaken to compute the annual damage to man by the fly family all over the world. I suppose there is no use stringing figures clear across the page, and I am not sure that one line of them would be enough. There would have to be the constructive damage in such instances as the rendering uninhabitable of countries like South Africa, where the bite of the tse-tse fly is invariably fatal to horses, oxen, and dogs, without which it is practically impossible for man to engage in agriculture.



Fig. 1. *Comptosia macellaria*.
The screw-worm fly, adult, wings expanded.

In our own country those who saw the tottering wrecks of soldier boys come home from Tampa, where they quarreled with the flies for their food, need no argument to convince them that the flies carried the typhoid germs from latrine to mess-table and slew the flower of our young men by hundreds and thousands. The War of the Rebellion proved conclusively that flies inoculated every open wound with gangrene. The terrible "malignant pustule" is now known to be caused by the bite of gad-flies which have come from cattle diseased with anthrax.

The purulent ophthalmia almost universal in Egypt is the work of the common fly, and these very small flies that lay their vinegar-proof eggs in pickle-jars get into folks' eyes in the Southern States. More than once they have brought on such epidemics of "pink-eye" in Florida that the schools have had to be closed. Asiatic cholera is now so universally known to be spread by flies that it is almost unnecessary to speak of it.

If you have not a very steady stomach perhaps you had better skip a little here. As a general thing I avoid the tragic and revolting, and as a matter of principle I believe that in a fiction story She ought to get Him and He ought to inherit the money, and the two of them ought to live happily ever after. But I think I have noticed that about once in so often we crave a sad and heart-breaking ending and hanker to be told something grewsome and horrible. I feel sure that what I am about to relate will satisfy that hankering for at least two weeks. But if you like, you may omit the next paragraph. I shan't feel hurt if you do.

A Mr. M. E. Hudson of Mapleton, Kansas, called a physician on August 22, 1882, and complained of a peculiar sensation at the base of the nose and along the orbital processes, followed by inordinate sneezing and an excruciating pain in the forehead and left upper jaw. In a week later he was dead, after having suffered tortures. After death it was found that all the tissues covering the bones of the spinal column had been gnawed away and the vertebræ exposed. The roof of the mouth caved in with the slightest pressure of the finger. The bones of the nose were loose and only held in place by the muscles. What caused it? A screw-worm fly laid its eggs in his nostrils while he slept, and upwards of 300 maggots were hatched there. There are many such cases known to medical history and only one reported recovery.

All over. You may come in now.

It is almost impossible to compute the losses caused by the various kinds of flies that attack domestic animals, but if we accept the estimate of Professor Herbert Osbourne, that one species of bot-fly—and that the easiest controlled—causes an average loss of \$2.50 a head to the cattle of the United States in injury to hides, beef, milk,

and lessened vitality, then the bill for this creature alone in 1900 was \$109,756,000. Buffalo gnats were reported to have caused a loss of \$500,000 to horses and mules in a single county of Tennessee in 1874. The worst of it is that these flies attack draught animals at the time when they are most needed to prepare the ground for crops, when every day is valuable.

There is something particularly fiendish, it seems to me, in the way these flies devil the lives out of horses and cattle. The poor animals nearly go out of their minds from the tormenting bites. A cow that ought to live in peace and quiet, devoting all her energies to putting on flesh or getting milk ready for the city market, is made to gallop all around till she is as thin as a rail and as tough as rubber, while all her milk is scared back into her blood. It isn't the mere pain of the bite that drives them frantic with terror, for the flies that scare them worst—the warble and the heel-fly—do not bite. They lay their eggs on the hairs just above the hoof, where the cow will lick them off. The egg hatches in the mouth and the larva has barbs on it, so as to work its way into the walls of the throat. Once there, it molts and becomes smooth, so that it can slide about for months through the tissues between the hide and the flesh. It finally reaches the skin along the back, molts again and takes on spines, with which it bores a hole out to the air. It creates an open sore, in which it fattens. When it is about to mature it comes out, drops to the ground, contracts and hardens, and in from three to six



Fig. 2. *Hypoderma bovis*,
ox-bot fly or warble fly.

weeks emerges an adult fly, ready to scare the flesh off more cattle.

What do you think of such conduct? Could anything be more fiendish in its plan, more unprincipled and selfish?

The Hessian fly, that ruins Heaven only knows how much wheat every year, is a true fly and—oh, well, pshaw! there is no use making a whole book on all kinds of flies, when I set out only to write one chapter on the flies that come into the house.



Fig. 3. *Hematobia serrata*, the horn-fly.

There is altogether too much of the "it is estimated" about the life-history of the common fly, for, strange as it may seem, it is an animal that is very hard

to rear from the egg. Other insects will live, move, and have their being in a box with gauze over it to let in air and light. All they ask is board and lodgings, and, like the curios in a dime museum, they will answer any and all proper questions; photographs for sale for their own benefit. But fit up the most luxurious quarters for flies, well aired and lighted, though perhaps small, stocked with all the delicacies of the stable and the garbage can, and they may lay a few eggs in a half-hearted sort of way and then incontinently turn up their toes and die. They do it for spite, I think.

Still there are many interesting things known about the fly, and as usual what are most interesting are not true.

About the time when McGuffey's School Readers were being compiled, books that I have no false modesty in saying formed and directed some of the greatest minds of the age, Natural Philosophy set for herself two definite tasks: (1) To demonstrate the wonders of common things, and (2) to prove that everything was created for some wise purpose. The danger that lurked in No. 1 was that the desire to exhibit the marvelous overcame the impulse to tell the simple truth, and No. 2 naïvely assumed that "wise purpose" meant the aid and comfort of the human race only, a very small percentage of the population of the world, when you come to think of it.

Wherein the fly was shown to have been created for some wise purpose has slipped my memory for the moment. I think it was said to be a scavenger that saved us all from dying in a hurry from dread diseases. In those days men were too busy in showing the wonders of nature to fool away time on the question of whether flies carried infection on their feet. In these days we have come to realize that a fly that has got itself mistaken for a currant, while dreadful to contemplate, is not so dangerous as a fly just come from visiting a typhoid-fever case, fished out of a glass of milk by a dear child taught to be kind to all living things. The fly in the cake may not be appetizing, but it is innocuous and thoroughly sterilized. As I say, the usefulness of the fly is a little dim in my recollection, but the wonders of its foot as celebrated in McGuffey's Fourth Reader I shall never forget. I think it was Uncle Harry, though it may have been Uncle James or Uncle George, had a microscope, and showed to the good little boy and the good little girl the air pump with which Mr. Fly exhausted the air from under his foot and stuck to the ceiling or

the window pane by the pressure of the atmosphere, which is fifteen pounds to the square inch.

"Oh, sir!" exclaimed Willie—I think his name was Willie; it ought to have been; he was a good little boy and gave his dinner to the blind beggar and was kind to all; he even played in public with his little sister, and a boy that will do that needs watching—"oh, sir!" exclaimed Willie, "that is like the leather suckers with which the boys play. They wet the leather, to the center of which a stout string is attached. Then they stamp it upon a paving stone, and it adheres to it so that it is possible to lift up the paving stone."

"Exactly so," said the wise Uncle Harry.

That happens to be about the case with the fly's foot, but Uncle Harry was quite in the wrong in pointing out the air pump in the fly's foot, for the reason that there is no air pump there, and even if there were the atmospheric pressure would not be enough on the surface of the fly's feet to hold up more than half his weight. I am glad, though, that little Willie mentioned the leather suckers, because ever since then when anybody has begun to explain anything by saying, "It works on the principle of those leather suckers the boys play with," I know right off what he means, which I should not if I had never read McGuffey's Fourth Reader, because in all my life I have never seen one living human boy play with any such a toy. Others may have experienced that pleasure, but it has been denied me.

It was a French abbé with the Thackerayan name of De la Plouche who first suggested that flies gummed their feet to the wall with a viscid liquid. I am glad to state that this man was laughed at all over the world, and that the air-pump defenders proved conclusively that it was all nonsense, because, don't you see, if a fly has wet feet

he would track on a polished mirror, which he did not, so they said. The fact appears to be that he does. Then somebody else with a low, groveling, materialistic mind who wanted to take all the poetry out of life, hinted that the claws on a fly's feet might not be solely for ornament, but might be used to clamber up roughness in glass, imperceptible to us, but useful to the fly. This man polished glass to the last degree and rubbed it with impalpable powder and set a fly to walk up it. I suppose that was the first time in the history of the world that a fly lost his temper. It does not mind being shooed away. It thinks you are playing tag with it and enters right into the spirit of the game. But when that fly started up that pane of glass and felt its feet slip from under it as though they had roller skates on and it came down ker-wallop! it must have been so mortified and surprised that it did not stop to inquire if there were ladies present, but just talked it off as if it were an army officer.

The fly has two pads on each of its six feet and twelve hundred tenent hairs that exude a gummy fluid. It sticks fast like the leather sucker or a wet finger to a page. When it wants to lift its foot, it pulls it loose as a man takes off a porous plaster, beginning at one corner. Along toward frost, when folks talk of putting up stoves and flies begin to feel right poorly in the mornings, some of them cannot muster up enough strength to wrench themselves free, and, first thing they know, a yeast-like organism locates on them and devours them with a white fuzzy substance. Scientific men call this organism *Empusa*, but in fly language I believe the name of it is, "Good-by, John."

It has been discovered that there are enough wonderful things in the world without our being compelled to lie to make life interesting. Of course, if you have to lie to

hold your job, the case is different. Even though the fly's foot may be no more marvelous than a postage stamp, its wings and eyes are not without merit.

Other insects have two pairs of wings, but the fly has only one pair, with a scallop on the rear edge of each, which shows that the rear pair went into the discard. These scallops are called *halteres* or balancers, and it is the theory of some that they help the fly to steer. They say that when the starboard balancer is clipped off it puts the fly hard a-starboard and similarly with the port balancer. Under each of these scales is a globe on a slender stalk fringed with fine hairs, believed to be sensitive to odors. These globular processes pump air into the veins of the wings to keep them taut and stiff, for thin though the fly's wing may seem, it is nevertheless a double texture. Perhaps clipping off the balancer lets the wind out of the wing and so disables it. A fly is able to saunter along through the air at the rate of five feet a second, but when it is in a particular hurry it can go about thirty-five feet a second, which is a 2.30 gait. Its wings beat the air about 675 times a second. How do you suppose they found that out? How would you go about it to count 675 times a second? Couldn't say the numbers that fast, could you? Give it up? I am astonished at you. I am really. Nothing simpler. Listen to the musical note made by the fly's wings. Find the same note on the piano. It is about E, first line of the treble clef, which is made by 675 vibrations a second. When the fly gets excited and cannot break away from the fly-paper, it makes its thorax vibrate at a livelier rate. You have heard people talk about Campanini's being able to sing high C with chest voice. He could not, nor any other man—but a fly can.

We do not know much of the house-fly's general intel-

ligence and mental capacity, but I am inclined to think that what there is must be all on the distaff side. The male cannot amount to much intellectually, for his eyes are so close together that they touch each other. That's always a bad sign. I never saw anybody with eyes so close together that was very bright. The male green-head horse-fly has a wife that viciously nips the bare legs of bathers, but he is a harmless, poetical little fellow, and drinks nothing stronger than nectar, which he sips from flower-cups.

The fly has two sorts of eyes, the big compound ones, four thousand in a bunch on each side of the head, for knocking about in daylight, and three simple eyes on the top of the head for use in a poor light, sewing, and fine print.

Before going into ecstasies of admiration of the wonderful view a creature must have that has eight thousand and odd eyes to see with, it might be well to remember that they are not of much account. In the case of old flies kept over winter the compound eyes are all caved in and broken, yet they seem to get along tolerably well. Just to test them a kind gentleman varnished over the simple eyes of some flies whose wings he had plucked off. He found that he might hold a candle close enough to the compound eyes to burn them before the fly had any notion that anything out of the common was going on. In daylight they worked better, but even so, he was able to bring a knitting needle close enough to touch the fly's antennæ before it dodged. When the knitting needle was brought up on the side Mr. Fly picked up his sticking-plasters quite lively.

The fly has no biting apparatus to speak of. Its tongue unlimbers and extends, its broad, knob-like end divides into two flat muscular leaves which suck up juices and

have a rough rasp with which it scrapes off the albuminous surface of book-bindings.

The house-fly I have spoken of as if he were one. But, like the little girl also in McGuffey's Reader, he is seven. The commonest summer boarder in our houses is *Musca domestica*, present all over the globe, wherever man is. Formerly it was one of the simplest sums in arithmetic to figure out the age of the world. Take the current year of the Christian era, for instance, 1902. Add to it 4004.

Ans. 5906, age of the world. Q. E. D. Nowadays it is a more complex calculation. It is not a question of years, or thousands of years, but of periods, spelled with capital P's, that may be stretched to the length of any number of millions of years, thus vying in elasticity with

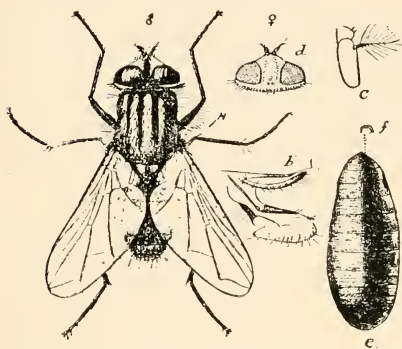


Fig. 4. *Musca domestica*, the common house-fly: a, adult male, b, proboscis and palpus of same; c, terminal joints of antenna; d, head of female; e, puparium; f, anterior spiracle.

"the original Hebrew." Granting the immense age of the earth itself, the next question is: How long has man been on it? It took all but blows to convince some people that man was extant in the later Quarternary along with the cave-bear and the woolly elephant, and, having yielded so much, they will not budge another inch, no matter how the reckless fellows of the opposing team tug at the rope and insist that there is good evidence that man existed in the later Tertiary. Myself, I think it would be well to have a little fun

out of it. If they want the rope so much, give it to them suddenly and own up to Tertiary man. I will tell you why. The fly is in the Early Tertiary. Preserved in amber of undoubted Early Tertiary he is there, as large as life and a mighty sight more desirable to have about the house. Knowing the fly as we do, knowing his irrepressible propensity for thrusting his society upon us, no reasonable person can doubt that, when asked in preceding ages to step into the world and make himself at home, he waved a graceful negative to the *Goniasteroidocrinus tuberosus* and the rest of them. "No," said he, "no. You fellows go on. I'll wait for man. He'll be along pretty soon."

What he wants with us I declare I don't know. It can't be the table we set. Considering his taste in comestibles, that were a compliment of the most left-handed kind. No. In a sunny dining room you see them flying about, paying no particular attention to the food. Other pests live all the time in the house, but the fly comes in only when it is grown up. I think it does it out of pure meanness. It knows we don't want it about and it comes in just to tease. I am sure it recognizes man as existing and gets used to having him around. A fly that is, as you might say, house-broke, will let you come close enough to it to snap a rubber band at it, but a wild fly won't.

It is faithfully believed by most people that, when thoroughly infuriated, *Musca domestica* can bite. There are enough bad things to say without resorting to calumnious falsehood. Tickle it may, but bite it cannot. However, its second in numbers, the stable fly, *Stomoxys calcitrans*, sharp-mouthed stinger, can and will unsheath its dagger of a tongue and pierce through thin cloth, giving what in Christian Science is called "an instantane-

ous demonstration," that, however much it may look like *M. domestica* with a soft proboscis, it is by no means the same sort of fly.

Third in the order of abundance is the cluster-fly. It is somewhat larger than the domestic fly, and has a dark, smooth abdomen. Never so active as



Fig. 5. *Cystoneura stabulans*, stable-fly.

the others, in the fall it is very sluggish, and gets stuck fast in its own glue, perishing in a white efflorescence of *Empusa*, and decorating the windows in a cheerful manner. Next in numbers comes another stable-fly, whose personal friends and acquaintances are few, and then the so-called blue-bottle or blow-fly, whose sense of smell is so acute as to lead it unerringly to where the cold meat has been put away. This dear little creature in blue satin brings forth its young alive and imbued with strong prejudices against vegetarian principles. It is of record that toads have made hearty meals on blue-bottles only to perish miserably, the children avenging the death of their parent without waiting for the slayer to die. I can imagine the last words of Mamma Blue-bottle as the toad's tongue nailed her: "I die happy. I am avenged, and my children are provided for." How she must chuckle at the joke!

There are the green-bottles, comparatively scarce, and last in the list a paler creature, more pointed in the body, with large, translucent spots on the abdomen, through which the light shines. They are rather smaller than the standard house-fly, but size is not a criterion of family, nor is it a guarantee of youth. When a fly arrives at the stage where it deserves its name it is as large as it ever will be. Little flies are only the last of the batch, and,

like little men, would have been bigger if they had had enough to eat when they were babies.

What ray of hope can the lamp of Science cast upon the fly-ful gloom before us and our children? Will there ever come a day when the rubber band shall snap on the wall for the last time, and the resulting splash be glassed over with a label pasted on the under side reading: "Here perished the last wild fly, July 8, 19——"? Science shakes her head moodily. Pressed for a categorical answer, she says something about screens, hearing which the housewife smacks her hands together and lets them fall despairingly into her lap. "Screens?" she groans. "Screens? Haven't I got screens up all over the house? And just look at it! Just look at that chandelier! You know it never, *never* will come off of brass. I'd like to know where they get in at. I'd just like to know." And then she takes a paper in each hand and flaps it and makes ungraceful leaps up to knock the impudent beasts from the ceiling. She drives them out into the dining room and thence out into the kitchen, and so on into the open air. The flies scurry and dodge and flee back on one side of the room while she is battling on the other. They get their breath back and are ready for another run, but she has no rest. After she has wrought herself into a gasping perspiration and shut the house all up there are just as many flies as before stippling the chandelier and buzzing: "A-a-a-ah! Did you ever get left?"

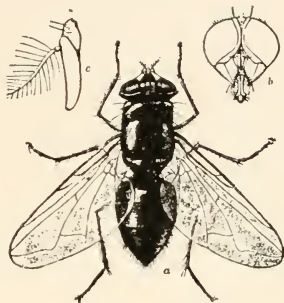


Fig. 6. *Lucilia Cæsar*, the green-bottle fly; a, adult; b, head from the front; c, antenna.

She tries this paper that you soak in a saucer of water and sweeten to taste. The saucers ornament the parlor center table, the sewing machine, and the shelf over the sink. Total mortality for the week, eight flies.

She tries sticky fly-paper. That catches a great many at first. It is really good sport to watch, if you are fond of tying firecrackers to dogs and doing up the cat's feet in paper. When the lure is first spread out a fly sees its moist glitter and says to itself: "Taffy! Me for that! I could just *live* on taffy." He alights. It does not taste as good as it looks. No flavor to it. He thinks he might as well go somewhere else.

"Oh, stay awhile!" says the fly-paper.

"No," says the fly. "I got a date with a feller. Let go."

"Oh, what's your hurry?" coaxes the fly-paper.

"Quit your foolin'," commands the fly. "I gotta go. Let go now!" The fly is getting angry, but the paper preserves its temper.

"Oh, I wouldn't be in a rush! You got all the time they is."

"Leggo now! Leggo o' me! Leggo! Teacher! Make him let me be!" And then it begins to scream and fight. It is most entertaining to watch the tragedy, if you are of a vindictive and revengeful spirit. The poor creature struggles and struggles, each effort bringing nearer the moment when it shall sink to rise no more. The humans giggle greedily. "Christians to the lions!" cried the mob in Nero's day. "Flies to the sticky paper!" cry the moderns. One poor fellow near the edge with supermuscan strength drags himself free to the plain paper, and as he pauses for breath ere he can plume his gummy wings for flight, Kenneth catches him and thrusts him back into his doom.

Mothers and fathers of America, consider what must be the moral influence of sticky fly-paper upon your sons and daughters. What boots it if you teach them the sublime truths embodied in :

“ I love little Pussy, her coat is so warm,
And if I don't hurt her she'll do me no harm,”

so long as you yourselves set the example of laughing at the miseries of helpless creatures whose only fault is a weakness for drowning in the cream pitcher ?

But by and by the word seems to be passed around : “ Beware yon glittering expanse,” and then, put the fly-paper where you may, seldom, very seldom, shall you hear the sharp note of some spent buzzer in his agony. Sticky fly-paper, too, has a way of curling up and of flopping, sticky side to, on things and persons, and in such case it is a very unfunny affair. Alcohol will dissolve the gum if you should happen to come downstairs in the dark and knock off the fly-paper and step on it with your bare feet. I tried alcohol, and it took the stuff right off. I thought you might like to know. I was going to try kerosene, but it was in the cellar-way.

I didn't care to walk so far.

If you burn insect powder in an old tin pan, it will kill mosquitoes. A person, I mention no names, tried it to kill flies. It made the house smell like Fourth of July, though quieter. The flies went about their business as usual, and never so much as coughed. Two or three alighted on the edge of the pan. “ Hello ! ” said one. “ What's this ? Something new ? Say, where was you yesterday ? I was lookin' for you all over.” It never feazed them. Lavender flowers scattered about, they say, will discourage flies. Don't you believe it. They won't do anything of the kind. At the soda fountains, though,

where otherwise the sweet slops would attract flies by the millions, the druggists sprinkle essence of sassafras. It is rather amusing to watch a fly sail in the door and make for the counter. "Lemme see now," you can almost hear him say, "I think I'll take vanilla ice-crea—" And then he strikes that sassafras and cries: "Pue! Let me out of here quick!" Flies do not like sassafras at all. It is rather an insistent perfume, and I do not know that I myself should care for it at breakfast, luncheon, and dinner for weeks and weeks, all through fly-time.

There is a cheerful story that in Italy they stretch white threads across a window an inch or so apart, and if there is no other outside window in line with it so that they can see daylight through, the flies will not creep between the threads. They think they are spiders' webs, and they know well enough that such places are better kept away from. Herodotus says that the fisherman of the Tigris prevented the flies and gnats from biting by wrapping themselves up in their nets, for though the tormentors would pierce through cloth, they feared the nets. Herodotus was a gifted man in some ways.

Hear the conclusion of the whole matter. The armies of flies are to be discomfited only by attacking the base of supplies. It is an old saying that if you kill one fly, forty will come to the funeral. These little skirmishes with fly poison and sticky paper are useless. To fence ourselves in with screens is hardly worthy of civilized people. It is like living in forts besieged by savages. It is sometimes said that the old-fashioned housekeeper who is forever cleaning up is bothered with few insect visitors of any kind. But I put up an umbrella against the storm of indignation sure to break over my head by declaring that the most scrupulous cleanliness will not avail when there is a stable near. One stable will keep a large

neighborhood amply supplied with flies daily in the season.

In a quarter of a pound of droppings taken from the center of the pile were found 160 larvæ and 146 pupæ of the common house-fly. Call it 300 young flies altogether, and if the rate holds good there should be 1200 flies to the pound of stable refuse. It is possible by throwing the manure, in which they breed, into a pit and covering it with quicklime to kill the eggs and larvæ, but where one man is thus careful, nine hundred and ninety-nine will not take the trouble. So great has been the progress of the trolley-car, the bicycle, and the automobile that everyone has confidence in the ability of invention to give us horseless travel, but we shall look long and look in vain for the day of cow-less milk. Till then we shall have to endure, with Pharaoh of the Exodus, the plague of flies.



CHAPTER III.

THE WAY OF THE MOSQUITO.

WHEN a man hears for the first time that it is the female mosquito that does all the biting, it makes him feel right glad. For if there is any one thing his sex has felt bound to prove, it is that the women are the cause of all the trouble in the world. It is a joke nowadays, but it used to be a very serious business—serious enough to make it matter of religious belief. Old Dame Nature must have had many a good laugh behind her hand at the earnestness with which man has set about his task, knowing that the males of any kind of creature are perfectly useless, so far as doing anything is concerned. If they are coddled and carried about, as in the case of certain flies, it is because they are needed to keep the race going. As human babies got to be more and more of a bother, so that our foremothers could not take care of them and provide for the family too, our forefathers were distracted from what had been their previous occupations, looking pretty and fighting—both of tremendous importance and the cause of our being what we are—and were set to minding the young ones and providing food.

We can picture our distinguished ancestors squatting in the sun and blinking while they decided that woman had too much to say, and was inclined to multiply words when she wanted her man to do something to make

himself of some account about the house. They agreed that she was inquisitive and prying, and that she was an inferior being, because she worked while he sat still and thought. Being an inferior creature, her place was to keep in the background. But woman has kept dinging at man to do this and that little job of work, until now their positions have been reversed and she is the one that sits around and looks beautiful and gives her mind

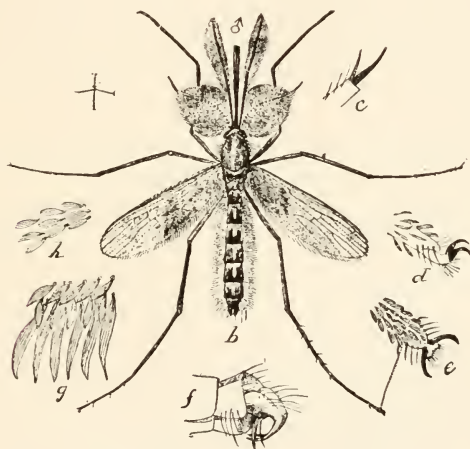


fig. 7. *Culex pungens*, male, common mosquito.

to philosophy. It is one of Dame Nature's greatest jokes that the purely ornamental classes shall be looked up to and respected by those that do things, so that in these days man hardly dares say anything about women being inferior creatures except under cover of a joke. Still there is a bit of the prehistoric in him, and he secretly enjoys hearing that it is the female mosquito that does all the biting.

Further comfort is afforded by the knowledge that the

male mosquito has probably the keenest musical sensibilities of any of his class of animals. He has quite a brush of hairs on his antennæ, and with them he hears. Mayer stuck one of his kind on a glass plate and sounded tuning forks about. When one tone was made certain hairs would vibrate, while all the others were still. Another tone would start another set to vibrating, and so on. Also, if the tuning fork were at one side of the mosquito, the hairs on that antenna trembled most violently, so that when the male hears, or rather feels, the voice of his beloved in one antenna, he wheels about so that the vibration is equal in both and flies straight ahead to meet her.

This is about all there is to the male mosquito, except that he cannot bite for the sufficient reason that he has no apparatus with which to saw through the skin. So to speak, he has the pumps, but no drill. If he eats at all after he comes out in wings, it is as much as his contract calls for. But the female is thoroughly equipped for getting through even a politician's hide. In her an insect's ordinary biting jaws are represented by four fine-pointed bristles barbed at the tip like a spear. A straight cylindrical spike, no thicker than a hair, forms a trough for them to lie in. At its end it opens out into two small, fleshy lips, corresponding to the folding leaves of the blow-fly's proboscis. When these lips are pressed against the flesh, the bristles are compressed into one drill, forced down the trough in which they had been lying, and into the skin, separated in the middle and bent back toward the insect's breast.

The mystery is what possesses her to want to bite at all. How does she come by her hankering for blood? The scientists give it up. If she laid her eggs in the wound, like the carrion-fly, it would be easy to answer the ques-

tion, but she doesn't. If she stung to defend herself, like the wasp, it would be easy. It must be her brutal passion for blood that prompts her to attack helpless human beings. She cannot get this craving by inheritance, for the chances are that none of her ancestors as far back as William the Conqueror ever had a taste of human blood, and yet, sit out on your front stoop of an evening, and a mosquito, not half an hour out of the water, will make as straight for you as if she had been born for that purpose. When one thinks of the great clouds of these torments that live and die in swamps where no warm-blooded



Fig. 8. *Culex pungens*, female, common mosquito.

animal ever comes, for fear of being mired, one can easily believe the estimate of entomologists that not one in a million ever samples red blood.

It is supposed that the true food of the mosquitoes is vegetables, but they have been known to eat the chrysalids of butterflies, young fish, and even turtles. Hardtack they have been noticed to enjoy, and hot boiled potato with the jacket off; honey appeals to their fancy; molasses is not so bad; they tipple a little beer when they can get it, and a watermelon rind is deservedly popular with them. But human blood is what they chiefly delight in. A tender-hearted person is tempted to let them bite all they want, seeing how keenly they enjoy it. One of them lights on the hand, ravenous as a wolf, thin as a needle,

and of a dusty gray-brown color. She cuts through the skin with her saws, and, oiling up with a tiny droplet of yellow poison that seems to dilute the blood to her liking, starts the pumps. Then she begins to swell into a pink, berry-like being, and she has been known to linger at the delicious draught so long that she pops open. A happy death! But, as a rule, she knows her limit, and when she feels that if she takes any more she will not be able to navigate, she says, "No more for me," and flies away—not far, for she has a load, and the sharpened pitch of her humming wings tells how hard it is for her to go. Follow up her flight, and you will see that she stops to rest every few feet. How the others must grit their saws when she tells them about it! They must make a regular Dewey of the one that gets away alive after such a feast. Perhaps it is the desire for glory that impels them to deeds of blood.

This is a great country, with a wealth of natural resources, and we take a place second to none in the abundance and variety of our mosquito-supply. Some thirty varieties of the creature have been more or less studied. It is estimated that not half of the kinds in the United States have been observed or named. The naturalist is usually able to keep his temper, but his mental attitude toward the *Culicidæ* may be seen even through the Latin when he names them, *damnosus*, *excrucians*, *provocans*, *implacabilis*, *stimulans*, *excitans*, *impatiens*, *punctor*, *molestus*, *pungens*, and the like. *Culex pungens* is probably the commonest about the middle part of the country, although *Anopheles punctipennis* and *quadrimaculata* possess a more feverish interest for us, as I shall show later. In the northern parts *C. consobrinus* has rather the call. It is a hardy annual, and has been known to bite freely in a snowstorm. In Minnesota it

blackens the snow when the ice in lakes and rivers is five feet thick. In no place on the continent are mosquitoes more maddening than within the Arctic circle. One would think that the extreme cold would freeze them out. On the contrary, they like seasonable weather; they want it to be cold in winter. Wade, of Boston, found them in his cellar so thick that they clustered around a lamp chimney half an inch deep, and yet they shunned the corner where the hot-air pipe was, preferring the cold places. Generally they winter in barns, garrets, and under bridges. In the South mosquito nets play an important part in the Christmas decorations. In those sections of the country where there are prolonged dry seasons, the adult mosquitoes live on and on, watching the weather reports daily, anxiously awaiting a chance to lay their eggs as soon as the rains bring convenient puddles.

English people will tell you that in their happy isle there are no such things as mosquitoes. One gets pretty well used to this kind of talk in general, but in this particular instance the boast holds good, or, rather, did hold good until within the last few years. It is not alone dollars that the summer tourist has brought to London. Mosquitoes have been imported on the ocean steamers, and they have distressed the native British more than the American visitors. Probably the name is a potent one to conjure with, and some idea of what terrible things are expected of mosquitoes may be learned from this simple tale of the "North Countree." Some miners in remote workings of a Yorkshire colliery reported to the superintendent that they had been much annoyed by the bites of mosquitoes. He went down to see about it and found a large and energetic colony of yellow-banded wasps—"yaller jackets," if you like that better.

As to offspring, mosquitoes believe: The more, the merrier. Well, they may; they don't have to raise them. There is no walking the floor nights with the youngest, or sitting up to mend stockings; no worrying about the second summer—you know if you bring them through the second summer all right;—there is no scheming to put Tom through Harvard, or Dorothy through Vassar. It is very simple. Mamma lays from twenty to forty dozen eggs in some quiet pool, along about

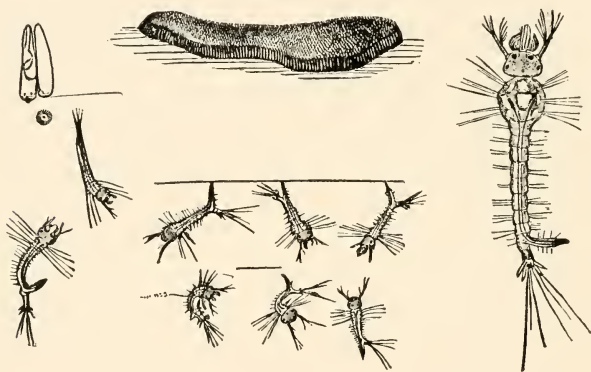


Fig. 9. *Culex pungens*: egg-mass above in the center; young larva, greatly enlarged, at right; young larvæ, not so much enlarged, below; enlarged eggs above at left (original).

three o'clock in the morning, and considers her duty amply done.

The inherited experience of ages has taught her that it is best to mass them together in a pointed ellipse slightly concave on the top, the eggs being little end up. The air so sticks to the mass that it is impossible to wet it. Push it under water and it bobs up again, light as a cork. In sixteen hours the larvæ come out on the under side and begin a most active existence. They are the wigglers

that used to infest the rainwater barrel at the corner of the house "in the airy days."

The wiggler has two stages of existence, larva and pupa. For seven days it has hard work to get up to the surface to breathe, but when it changes, it has hard work to get down to the bottom. Two days later its clothes begin to feel tight, and when all the back buttons burst off, it crawls out, using its old frock as a kind of boat, while it gets its wings straightened out. This is a very ticklish job, and many a young life has been lost by drowning at the very beginning of a promising career. The fact that so many eggs are laid would indicate, if nothing else did, that many mischances await the mosquito at all stages of its existence.

One of the most sovereign remedies for the plague is to introduce small fish into the breeding places. In the Riviera, where drinking-water is a precious thing, they put carp in the tanks. The little stickleback is the best for this climate in shallow waters. C. H. Russell, of Bridgeport, Conn., noticed that of two little ponds left by an unusually high tide at Stratford, the one in which there were a few small fish was free from wigglers, but the other, which swarmed with them, had no fish at all in it. A touching story from Beeville, Texas, tells of the devotion of the people there to a fish, insufficiently described as "a little perch" (as if anybody could tell what that meant)—that eats up mosquito larvæ, and so helps to make happy homes in the great Southwest. But there are not enough wigglers to make it worth the while of the little perch to continue the business, so the inhabitants use a particular form of flytrap that collects that household nuisance alive. When they get about a quart or so they take the collection down to the river and there make an offering to the little perch. This may seem a hard saying to many. Yet

there doesn't seem to be any other way than to believe it implicitly, for the United States Department of Agriculture prints it as a scientific fact. Then there are the dragon-flies that sail through the air and gobble up mosquitoes and flies with a zest that has no limit. At one time there was talk about encouraging the production of dragon-flies, or "snake-feeders," as the boys call them, but it has fallen by the way-side. If they could be induced to keep late hours, there would be some use in them, but they go to bed early, while the mosquitoes prefer the night for their operations. There are so many people sitting out on their front stoops then, or trying to get a little sleep. And this brings up another pretty story. That heartener of the discouraged, John Habberton, who wrote "Helen's Babies," declares that even the dead dragon-fly is useful. Get three or four of them and suspend them by silken threads on the front stoop, and he says no mosquitoes will come near. It sounds reasonable, and Mr. Habberton declares it is so, but when an entomologist hears about it a queer sort of smile comes over his face. He is likely to hint that mosquitoes will come thicker than ever, curious to know what the dragon-flies are doing out so late. It isn't well to provoke mosquitoes to wrath, and undoubtedly they would be very angry when they discovered that a deliberate attempt had been made to deceive them.

A third method was described to me by a clergyman, which would seem to inspire a perfect confidence in it had he not been notoriously fond of his joke. He said that in Florida when a man had his vengeful spirit so aroused that nothing but the death of many mosquitoes could pacify it, he would take a hammer and crawl under a big iron kettle. When the mosquitoes had drilled through the kettle to get at him he would take the hammer

and clinch their bills fast so that they could not get away, leaving them to perish miserably. My informant denounced this as a cruel practice.

A great many mosquitoes are killed by being slapped to death, but if only one in a million gets a taste of blood, and even if, say, one in three is slain by the enraged human (a liberal estimate), it is easy to see that this is almost insignificant as a cause of mortality.

It must be confessed that we are more interested in how to get rid of the mosquito than in anything else about it. If the species should become as extinct as the dodo, a sigh would go up, but not of regret. Most of the mosquito remedies are mere palliatives. Oil of pennyroyal, sassafras, kerosene, and all kinds of messy things have been recommended to rub on the face and hands to keep the torments away. But mosquitoes seem to be very much like human beings in the matter of drink. There may be a good many annoyances to put up with in the process of getting the blood, but the thirsty mosquito faces them all. They do say that if you burn insect powder it will keep them off, and if they are in a room the acrid smoke will stupefy them and you can sweep them up and burn them. Also you can take a blacking-box lid and nail it on the end of a long stick, and then put kerosene in the lid and go about the room holding it next to the mosquitoes as they cling to the walls and ceiling. They say that the insects will fall into the kerosene and die suddenly.

But this is only pottering round. What the country needs is a wholesale slaughter so that the day might come when a man could call to his wife: "Mary! come out here quick. I want to show you something. Hurry or she'll get away. Look there! See it? No, no, silly! not over there. Right where my finger is pointing. Don't you

see it? Well, of all the stu—— Can't you see it? There it goes. Well, it was a mosquito. My, my! that's the first one in—let me see. Why, I guess it was the summer before Willie was born. How old is he now?'

Alas! I fear I shall not live to see that day. Not because there is no universal extirpation method. There is, and it is very simple. Where it is not desirable to drain off the marshes in which the mosquitoes breed, or to stock the pools with fish, a little kerosene on the water will not only kill all the wigglers when they come up to breathe, but *all the females before they lay their eggs*. This last statement has more of the rainbow of hope in it, especially to suburbanites, than any other ever propounded to the human race. One ounce of the cheapest kerosene will cover fifteen square feet of water so as to be a perfect insecticide for all aquatic bugs. One barrel will cover ninety-six thousand square feet in the same effectual manner.

It should be remembered that the lady mosquito is not pickish or hard to please about the size or permanency of the pool on which she lays her eggs. Any transient puddle, or any place where water will stand for a week, will bring forth enough of the torments to keep a neighborhood unhappy. Old stumps bottles, empty fruit-cans, rain-water barrels, tanks, unused wells, or cesspools, all these she can be trusted to find out and put to what seems to her to be a good use.

L. O. Howard, entomologist of the Department of Agriculture, was about the first person to apply the treatment and record his observations. He tried it on a pool whose sixty square feet of surface teemed with insect life. After the oil had been applied, he counted 7400 dead aquatic insects, 370 of which were mosquitoes. In a certain New Jersey town—they are a little touchy on the

subject of mosquitoes in Jersey, and the man that reported his observations requested the department kindly to omit mention of his name and place of residence—a citizen took kerosene worth \$1.70 and paid for the labor of two men for two hours and thereby obtained entire immunity from mosquitoes for three weeks. Near his house were two horse troughs, a marsh, and a mill pond. A layer of kerosene cast on with a cup slew all his winged enemies. At the Agricultural College of Mississippi it became necessary to erect eleven large water-tanks on the campus. That summer mosquitoes, which had never before appeared in sufficient numbers to bother anybody, made life almost a waste of time. They increased so rapidly that the situation became serious. Howard Evarts Weed came to the rescue with the kerosene cure. He was flouted as one that had imagined a fond thing. But he dipped up a glass jar full of wigglers from the tank, poured kerosene on its surface, and in fifteen minutes he triumphantly pointed out the fact that they all were dead. A cupful of kerosene in each tank freed the campus of all mosquitoes within ten days.

What hinders, then, that the country is not freed from this pest? In the first place, it is everybody's business, and that is well known to be nobody's business. Isolated effort accomplishes little. One would think that the increased values that would be given to suburban real estate by the knowledge that it was free from mosquitoes would tempt the owners to get together and put kerosene on the still waters. On the contrary, nothing can persuade them to admit by word or deed that there ever was a mosquito in the county. Full of the belief that he was doing mankind a service, L. O. Howard once printed an account of how he had killed seventy-five mosquitoes in his room in a New Jersey hotel by the blacking-box-lid

method before described. In the next mail he got two letters warning him that if he ever set foot in that place again he would be mobbed.

Up to a very recent date indeed, practically about the time we got control of Havana, anyone making any serious effort to kill off mosquitoes must have seemed to most of us somewhat fussified. A body oughtn't to mind a little thing like a mosquito bite. And yet before we knew as much as we do now about the evil effects of mosquitoes, there were many well-authenticated cases where they had induced acute mania.

H. Stewart, of North Carolina, who explored the Lake Superior region in 1866, narrates that one of the party suffered so from the bites of mosquitoes that he became violently insane, and ran off into the woods and was never found again. Another man went crazy from the pain and loss of sleep, and in a frenzy of terror also escaped into the woods. He was captured after a fierce struggle and recovered when he was put under restraint for a few days. He was so affected by the poison, though, that he had to be sent home. Fever, pains in the limbs, and other unpleasant symptoms, attended even the men that suffered least.

Obviously, the reply of those who do not believe in bothering about things that nobody bothered about when they were young would be: "Oh, well! that might be where they were very thick, but we don't have many of 'em around here, only a few when the wind blows 'em over from the South Side." A good many very old people will not have nettings up at the windows. They say they don't believe in straining the air, and they say it with such a confident manner, as if, after that rap, you would never dare lift your head again. Of course it doesn't matter much, but I am sort of interested in

the mental process that is satisfied with that conclusion. It puzzles me. I declare I can't see for the life of me what there is that is so smart about it, and yet to hear them get it off you would think it ended the whole matter.

When you come to look over the problem of malaria in the light of recent discovery, it seems strange we did not sooner find out its intimate connection with mosquitoes. People used to say of a place: "There ought not to be any malaria there. It is good high ground, fine natural drainage, and far from any swamps." I

lived for a while on the Park Slope in Brooklyn. It was good high ground, far from swamps, and after a heavy rain-storm, if you had tried to cross the street and had waded through the torrents at the gutters, not being able to jump across, you would have been convinced that the natural drainage was excellent. The nearer one got to the Park, the higher the ground and also the higher the percentage of malaria, to say nothing of the rent. The high rent was easy enough to account for, but how about the high percentage of malaria? Now it is plain enough, for the Park swarmed with mosquitoes. Ordinarily, mosquitoes are scarce on high, well-drained land, far from swamps. We used to think that the reason why the pioneers that opened up Ohio and Indiana had "fever 'n

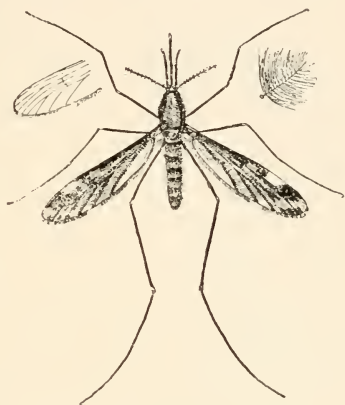


Fig. 10. *Anopheles punctipennis*, the malarial mosquito, female; with male antenna on right; and wing tips, showing venation, on left.

'ager " so much—they didn't call the thing by hisfalutin names in those days—was because they cleared off the forests and broke up the new ground. Maybe so, but I think the rain-water barrel at the corner of the house, all alive with "wiggle-tails," had a good deal to do with it. It is significant, too, that the murderous fevers of the West African coast coincide with swarms of mosquitoes. It has been shown that malaria among the British troops stationed at Hong Kong is at its lowest in February and at its highest in July. *Anopheles* are scarcest there in February and most plentiful in July.

Still, until it was definitely proved, as in Havana, that a man can be inoculated by a mosquito with yellow fever and die from the disease thus clinically planted in his system (a discovery in medical science hardly inferior to Jenner's when he introduced vaccination), perhaps the conservatives were justified in putting all their trust in quinine and regarding the mosquito exterminators as fussified. Quinine itself, it must be remembered, had no easy time making its way into the pharmacopœia of Protestant Europe. It had the bad luck to have the name of "Jesuits' bark," and folk had rather burn with fever and rattle their teeth with chills than countenance in any way the Pope of Rome and his detestable errors. Also there were several charms that counteracted the Mortal Mind that caused fever and ague. I forget most of them, but one had something to do with burying a new-laid egg at a cross-roads in the new of the moon and saying off something. However, the hated Jesuits' bark seemed to have so much better success than charms that it has become very popular. I knew a Methodist minister that was dead against liquor in any form, but if he wanted to preach a particularly powerful sermon he used to take

quinine until his ears rung. There was a young man in my class in college so fond of the drug that he would dip it out of a big bottle on his knife-blade and lick it off. He said it tasted good. It gave me the all-overs to watch him. They used to tell a story about a Hoosier going into a drug-store and asking the clerk for quinine. The clerk wanted to know it he would have it in capsules.

"Capsules? What's capsules?"

The clerk showed him.

"Right purty. What they fur?"

"To put the quinine in."

"Whutch want to putt it in them there boxes fur?"

"Why, so's you won't taste it."

"Good Lord! W'y, looky here, mister. I ben a-livin' on the Wabash bottoms goin' on thirty year. Quinine's ben meat and drink to me, 's you might say. And here come you a-wantin' to take the taste of it away from me. Why, darn your skin! Fur two cents I'd jump that there counter and give you the best lickin' you ever got. You—you whiffet! Aw, shut up! I don't want you to talk to me."

Quinine is certainly good for malaria, but it is powerless in yellow fever. Killing mosquitoes in Havana has been shown to abolish that disease and to make the most dangerous port in the civilized world one of the safest.

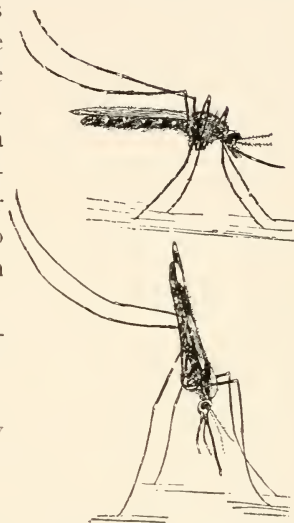


Fig. 11. How to tell the malarial mosquito from the kind that merely irritates. Watch how it stands at rest. The lower is the one that injects malaria germs in the blood.

In old times vessels lying two miles from shore, absolutely cut off from communication, have yet been scourged with the plague, and men wondered why. Now they know. In November, 1901, there were no cases or deaths from that disease in the Cuban capital, the like of which had not been for a hundred and thirty years. November had always been the worst month of all. In November, 1896, there were 244 deaths from yellow fever in Havana. Systematic extermination of mosquitoes was introduced there in February, 1901, and that it was worth while to pour kerosene on puddles of water is proved by the fact that from April 1 to December 5 of that year there were only five deaths from yellow fever, and no cases at all during the last three months of that year. Mosquitoes are still to be found, but only about one-tenth as frequently as before.

Yellow fever is a germ-disease. The tiny organism which causes the trouble lives in the red corpuscles of the blood. It throws off little spores, as does this white *Empusa* that kills the flies on the window-panes. These spores float around and seize upon and destroy other red corpuscles until the patient dies. Supposing him not to have been bitten by a mosquito, that ends the career of that set of germs, for their full life-round is not complete until they have been taken, with the blood of a human being, into the stomach of a mosquito of the *Anopheles* kind. Not otherwise can there be any mating of the germs. Certain of them, which undergo no development in the human body, when they find themselves in the stomach of the mosquito, go on to maturity, unite, and send forth elementary forms which work their way through the stomach of the mosquito into the salivary glands, and are jetted with that droplet of poison into the veins of the next human being she bites. The

Anopheles is the creature that thus conveys yellow fever and malaria. Certain kinds of *Culex* also make a hypodermic injection of the blood-parasites called *filaria*, which produce elephantiasis, a disease that causes enormous tumors and makes a man's skin thicken till it looks like an elephant's. That this actually occurs was demonstrated on a Chinaman, an animal very closely resembling a human being, but one that has no right to life, liberty, and the pursuit of happiness.

A celebrated Western orator once described a lonely ride he took upon the prairies in the early seventies.

"As I galloped along," said he, "my attention was suddenly directed to some distant horsemen who seemed to be making their way toward me. They wore feathers in their hair. I turned and rode in the opposite direction. I did not know who they were, but I knew dog-gone well they were no friends of mine." (I think it was "dog-gone" he said, but I won't be sure.)

In like manner, when we consider that these parasites cannot live out their full lives in either the mosquito or man, but depend upon getting from one to the other, though we cannot but recognize the ingenuity by which the transfer is effected, it hardly commands our unqualified praise. The device was scarcely for our aid and comfort. It seems to me that who undertakes to justify the way of the mosquito to man has a tolerably difficult cause to defend.



CHAPTER IV.

THE WICKED FLEA.

THERE is social distinction in insect parasites as well as in all other things that man has to do with. Certain undesirable creatures that become attached to us, that like us, we wouldn't mention by name for worlds unless we are talking to people that we are very well acquainted with indeed, "for fearful inferences the company might draw." These nameless foes in a way represent a low stage of culture. They stand for indifference to soap and water and fine-tooth combs. To know too much of them by personal experience is to be away behind the style. Cleanliness is all the go nowadays. But fleas are different. They are no respecters of persons. They bite the just and the unjust, the man with silk underwear and the man with no underwear at all. They do not depend upon the personal untidiness of their hosts. In a way they may be said, too, to have social distinction, for they don't take up with any and every body they meet.

Fleas haven't been studied very much. We had sooner kill them than study them, though they are about the finest specimen of a zoölogical oddity going. They are utterly unlike other insects, and these naturalists that cannot rest until they have pigeon-holed a creature and shown its relationship have had to walk the floor and worry more about the flea than any other

living thing. All other creatures of the six-legged kind are put into nomenclative pens according to their wings. If they have hard-shell backs like the potato-bug, they are Coleoptera, or beetles; if they have half-wings like a squash-bug, they are Hemiptera, or true bugs; if they have one pair of thin gauzy wings, like flies, mosquitoes, and such, they are Diptera; if they have two pair of these thin wings like bees, wasps, ants, saw-flies, and dragon-flies, they are Hymenoptera; if they have straight wings like crickets, grasshoppers, and locusts, they are Orthoptera; if their wings are covered with a mealy powder like butterflies and clothes-moths, they are Lepidoptera; but what are you to do with an insect that has no wings at all?

The best guess is that at one time they did have two wings like the flies. This was a good while ago. I have not the figures by me at the moment, but a little matter



Fig. 12. *Pulex irritans*, European flea; a, larva; b, pupa; c, imago.

of some five or six millions of years ought not to bother us. We will say that it was quite a while ago that they held a convention and decided to secede from the regular, orthodox, two-winged set and strike out on a new line for themselves. They didn't see the sense of justification by works when there were so many red-blooded animals about into whose fur one might snuggle down and keep warm. Grace abounded in the shape of hot, nourishing

blood to be had without money and without price. Wings were well enough in their way, no doubt, but if one is anxious to travel it is cheaper to let the other fellow do the locomotion and you ride about on him. If all the energy that was wasted in beating the slippery air could go into legs and leg-muscles, anybody with half an eye, which is about what a flea's eye amounts to, could see that it would be a good thing. Still, lest anybody should say to a flea: "Ah, you couldn't raise wings anyhow. I don't believe you ever had any," it was thought advisable to retain a tiny, wee scale on each side to show the place for them. That sort of saves their self-respect.

There are about a hundred chartered kinds of fleas in the world and about thirty of these are known in America. The flea you read about in European literature we do not have here to any great extent. I believe Canada has them. I suppose it seems more like "home" to have the real English flea, but here in the States we manage to plod along with what we have. The cat-and-dog flea does very well for our purposes, and can set us to scrambling and nipping ourselves as vigorously and as futilely as if it were the high-class flea of the court of St. James's itself. All thick-furred animals have them, as well as birds. Each species seems to be addicted to a particular animal, but all are enough alike to recognize each other as belonging to the same lodge.

Their specialty is a compressed shape from side to side, like a flax-seed stood on edge and fitted out with legs. Just to show how admirably constructed they are for getting through the jungle of upstanding hairs in which they live, the little bristles on their legs all slant backward from their heads. The old-fashioned "razor-back" hog was built on the same lines. The creature euphemistically called the B flat is the exact opposite of

the flea in shape. It is flattened horizontally so as to slip into cracks in the wood-work.

If the flea were still a fly it would need plenty of eyes, but as it works in more or less darkness it has reduced expenses by cutting down the eye account to one small knob on each side. We often say that we had rather suffer any other deprivation than that of sight, but that is because we have so much on our minds. If we are savages, we have to hunt our food and avoid being

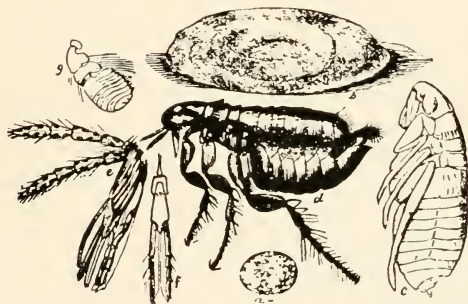


Fig. 13. *Pulex serraticeps*, the common cat-and-dog flea of America; egg-mass above; larva, pupa, imago, and implements of torture.

hunted by animals that consider us their food. If we are civilized, we have to read the market reports and dodge the trolley cars. But if we and our fathers and mothers before us for millions of generations had been engaged in a profession that entailed our dwelling in a perpetual twilight in a furry jungle, with plenty of food right beneath the grass roots, ready to ooze up whenever we sunk a shaft, warm meals at all hours, we should not care much what Consolidated Copper closed at. I fear we should not read at all.

It seems an idle existence, this thing of living off other people, but even millionaires are not really idle. On the

contrary, they are very busy most of the time. Whether their activity is beneficial to the race is something I do not care to discuss now. Fleas are not idle either, and the proof of that is their legs. Most jumping creatures, like the crickets and locusts, have their hind legs very highly developed. Once started into the air, their wings keep them going till they get out of the way. But the flea, having no wings at all, must provide for a contingency like that of the gentleman with whom they board becoming unreasonable and making a fuss about a mere bite. At such a time it is necessary to move from there expeditiously. So the flea's legs are all hind legs. To look at them, you would think that they had one more joint than those of other insects, but they are the regular standard leg. The difference is that instead of the joint attaching them to the body being small and inconspicuous, it is the largest and broadest of the leg. The flea looks to be a very awkward animal, but it is my experience that it is far from being such. I don't like the way the front legs are set on at all, and the last pair pleases me no better, but I must say in all fairness that all the fleas I have come in contact with—and while we kept the kitty they were many—managed to make those clumsy-looking legs serve them admirably well.

It was a most interesting kitty, fond of the strenuous life to that degree that I had only to hold out my hand as if grasping a big orange, slowly and tantalizingly making squeezing motions, when the jungle was instantly imported into my dining room. His ears would lay back and he would stalk my hand as if he were a tiger and it a nilghau drinking at a brook. His tail would lash, and suddenly he would fling himself like a Maltese bomb-shell at my unsuspecting hand and fight it like the very dickens. He was a kitten with a sense of humor and knew

that it was all make-believe, so he bit me softly on the muscles between thumb and forefinger and—well, he didn't scratch me very much. You must understand that a cat doesn't know how sharp its claws are, and perhaps it doesn't care a great deal, but Muff was very good to me. I'll say that for him. He would fight till he saw that he was going to lose his temper, and then he would break away and stand off at one side, thinking. Sometimes he would return to the charge and sometimes he would walk away. I know that his course of action depended upon that moment of deliberation, and I have often wondered what was in his mind. I could tell by the little kink in the end of his tail, that flopped first this way and then the t'other, that he was excited and full of fun, but I could see by the expression of his face that he was asking himself whether it quite became him, considering who he was and ail, to be on quite such hail-fellow-well-met terms with a man. A little innocent amusement is well enough in its way, but you cannot be too careful of the company you keep. I suppose a cat frolicking with a man and a man being mannerly to a negro must be very much alike. In the realm of pure ethics no fault can be found with either action, but in practice it seems something to be ashamed of. If the cat apparently said to himself, "Oh, well, there's nobody looking, and I might as well have another tussle with that hand," I felt flattered by the lunge he made for me, just as the negro must be pleased to be called Mister. But if he walked away as dignifiedly as if he had never demeaned himself by looking at the likes of me, I felt sheepish in spite of myself. I never gave in for a minute that I wasn't as good as he, for when I went back to my work it was always with some such argument to myself as, "This will never do. I can't be fooling away my time playing with

the cat when there's all this work to do and the rent's due and the bill from the grocer came in this morning and the baby has to have a new apron." Really, I knew in my heart and soul that I took up my pen again because the cat had snubbed me, and for no other reason.

Gildersleeves had a dog. Gildersleeves lived across the way, and there were several vacant lots with trees on them. The dog and our Muff had fine times p'aying tag. You'd see a gray streak across the landscape and up a tree, and then Gildersleeve's dog would bark and try to climb the tree on which Muff sat with his tail resembling his name. The dog would get tired presently and gape as much as to say, "Ho, hum!" and think a while and say to himself, "Well, I'll be going on. Time's a-passin' and I can't stay here all day." And he'd amble off, snuffing at the ground and stopping to look away off yonder somewhere. But at the cat, not so much as a glimpse. Cat? What cat? He hadn't seen no cat nowhere. What cat are you talking about?

Muff, up in the tree, would put out one paw delicately to come down. A cat goes up a tree beautifully, but its coming down I cannot conscientiously praise. Just about the time Muff would get so far down that he couldn't stop himself Gildersleeve's dog would fetch up with an "Oh, sure! Why, that cat back there in the elm. Here I was running off and forgetting all about it." And you'd see Muff, with his tail hard a-starboard, scudding for our front fence, which was dog-tight, and there he'd sit just out of reach and taunt; "A-a-ah! Did you ever get left?" till his breath was re-established, when he was out for another race. I never saw a cat caught by dogs but once, and then they were three to her one and had her in a corner. There was no change coming to them out of the transaction, however. The bulldog's nose

was a sight. It looked like a Hamburg steak, and he whimpered about that nose no little before it got entirely well.

There are many drawbacks to the keeping of a cat, and about this time I began to notice that when I got into bed things began to bite me. No, it wasn't—well, never mind what it wasn't, but I knew it wasn't, because we were the first tenants in the house and we hadn't brought any with us. First I thought it was only Mortal Mind, but Mortal Mind doesn't move around so. I tried to go to sleep, but the things wouldn't let me. I tried to slap the life out of the biters, and when I found they wouldn't hold still to be slapped, then I was surer than ever that they weren't—you know what. Well, sir, there was no sleep for me until I got a lot of insect powder and made the sheets nice and mealy. If there is anything I dote upon it is to feel powder or crumbs on the sheets. Mornings, when I'd come down to light the fire and put the oatmeal on, I'd find twelve or fifteen of the dear little things cuddling on my ankles. I'll tell you one thing: You must wet your finger before you slap it down on them, for they are so hard and smooth they can slip right out from under. And squeezing them between thumb and finger will not put them out of action, either. You must crack 'em between your thumb-nails. It takes a first-class mechanic to do that and not lose a great many.

I thought at first there might be only a few of them tracked in from outdoors, but I found out that, if I walked barefooted over the matting, I could collect quite a congregation of them on my ankles. So they were in the house. About that time I also noticed that Muff would suddenly drop everything to bite himself savagely. Come to look at him, that cat swarmed with fleas. Part his fur and you could see them scuttling around.

They say that a fox, when it thinks it has accumulated all the fleas it needs, will take a bit of bark in its mouth and wade slowly out into the water. The fleas keep moving up to where they can stand dry-footed until finally they are all crowded on that piece of bark and crying to one another, "For mercy's sakes, quit your shoving!" Then the fox lets go the piece of bark and the fleas drift off down stream, hallooing, "Help! Help!" and looking for the signalbook to see what spells "ship not under control." Then, if ever, is when they wish for wings. The fox walks back to shore flealess and happy. This is a wonderful instance of the reasoning power of the lower animals, provided it's so. I don't know that it is. I'm only telling you.

While Muff was a smart cat, he wasn't smart enough to wade in the water with a chip of bark in his mouth. Jumping through my arms was the limit of his education. I saw that it was no use to try to teach him the bark trick. He wouldn't see that it was wholly for his good, and would probably be offended by it. Somebody told me to get a paper bag and put insect powder in that and the cat, all but his head, and sort of mix them up. What could be simpler? Perhaps I didn't have a big enough bag, but I never knew before how many projecting corners and legs a cat had. I got him in all right. I am a persevering man and one not easily discouraged by trifles. I won't say I wasn't marked up some, but the scratches have long since passed away. I happened to have some sticking plaster in the house anyhow.

Well, sir, the fleas just bubbled up on that cat's head. You see, I couldn't hold the paper bag tight enough around Muff's throat without choking him. I might as well have done that though as get the name of it. Insect powder does not kill the fleas. It gets into their breath-

ing-holes, and they faint away if they can't get to the air. Those that escaped to the top of Muff's head weren't so stupefied that I could catch them with one hand. However, the experiment was a great success. I found a dozen or more in the bottom of the bag when I took Muff out. I burned the bag. So there were a dozen less fleas on the premises. I calculated that there were about 28,000 fleas to begin with. Repeat the operation twenty times a day and keep it up for twenty days—figure it out for yourself. It is a simple sum. I made up my mind, however, that if I were to have any of the beautiful morning hours to work in and the beautiful evenings to sleep in, something more penetrating would have to be employed.

I got tincture of larkspur and slopped it on the cat wherever it seemed necessary. I could feel Muff cringe and shrink where the liquid touched his skin, and I could see the fleas give a few kicks and die. To witness their death filled me with savage joy, but when I saw how mucky that cat looked and felt after I got through with him my heart bled. I knew exactly how miserable he was. It was just as if he had been in a barber's chair and the barber had got him swampy with scented water out of a porcelain bottle with the picture of a lady on the side and a small tube in the cork to jerk the water out with; as if the barber had sopped a towel-end wet with bay rum all over his face and pressed him with the dry end, and dabbed at the places where it didn't need dabbing and left him dribble at the moist places till the wind blew him dry. I knew the gummy, sticky, wretched sensation so well that I hadn't the heart to inflict needless suffering on a poor dumb brute. I mean the cat. Fleas I regard as beyond the pale of human sympathy. If any man is so constituted that his heart goes out to fleas and mos-

quitoes and bot-flies and—and other things, he is too good to live.

With all these efforts to improve the situation, I still found fleas in great abundance on my legs when I came down to light the fire in the morning. I want to tell you that to get fleas out of the house after they once get in is no five-minute job. In my own case, the problem was simplified by moving out of the house. I think burning it down would have helped some. But there are many people opposed to burning a new house just to get rid of fleas. Perhaps they are right. It does look wasteful.

Of all the practicable plans for the extermination of these pests the one adopted by Professor Gage of the McGraw Building of Cornell University is in my judgment the most picturesque. Professor Gage had the janitor of the building put on rubber boots. Then he tied sticky fly-paper on the boots, sticky side out, and had the janitor tramp around the rooms and halls for hours together. The fleas jumped on the man's ankles instinctively and stuck there. All, or nearly all (I like that saving clause), were caught and died a gaummy death. It seems a very good plan indeed. "Tie sheets of sticky fly-paper on the legs of the boots." Um, sounds easy, doesn't it? I wonder—— No matter. It doesn't signify. I am glad I did not have to do the tying.

Fleas lay their eggs loosely in the fur of the cat and the dog. If the cat and the dog can be made to sleep on one piece of carpet and this be shaken and swept into the fire every day, there will not be quite so many fleas, but the eggs keep dropping off all the time and falling into cracks in the floor and between straws of the matting. They hatch in about fifty hours into little white grubs that feed upon house-dust, the ravelings of carpets and clothes, flakes of cuticle, and all such. After they cast

their skin a few times they spin a little cocoon and then hop out with no taste whatever for dust, but a thirst for blood that a tiger cannot hope to equal. From egg to perfect flea is about four weeks. Careful sweeping will gather up a lot of grubs, but the mature flea is a hardy plant. Sometimes a plentiful application of insect powder all over the house will stupefy them long enough to sweep them up and burn them. Sometimes not. Sometimes benzine sprinkled all about will kill them all off and sometimes not. Taking up all the mattings and scrubbing the floors with scalding hot soapsuds with kerosene in it is good too. Every summer the newspapers print a paragraph about putting a piece of raw meat in the middle of a sheet of sticky fly-paper to catch fleas. It makes interesting reading and tends to make the column come out even at the bottom, but it does not work for a cent. The best way is to give away the cat and make the dog stay out of the house.

There is a very touching story about the mamma flea feeding her young with drops of blood. I should think this would make as fine a design for ecclesiastical embroidery as the equally true story that the pelican wounds her own breast for her children's nourishment. That is the worst of these emblems. A good part of the time they are founded on what isn't so. The mother pelican does not feed her young with her own blood, and the mother flea does not feed her young with anybody's else's blood. The mother flea does not care two pins about her young. She cannot be tied down with the care of children. She has a career of her own. I must exempt from this charge the jigger flea, or chigoe, of the warm climates. When the female feels the instinct of motherhood within her she does not merely bite, she burrows under the skin of somebody and swells up there to the bigness of a pea

as her eggs grow and hatch out. It hurts the person she has come to stay with. She feels sorry for him, no doubt, but she has a duty to perform and she performs it, let the consequences be what they may. It is sad to reflect that the person often dies, but her duty is to her family before everything. I call that a noble spirit, but I am glad that I live a long way off from the creature thus displaying it.

I suppose fleas, like the rest of us, soon become inured to scenes of suffering and come to the conclusion that in this world folks have to look out for the themselves, if they do not want to get left. It does seem a little heartless, though, that as soon as a cat dies all the fleas on her should leave and hunt for new quarters. After having been nourished and warmed by her you would think common gratitude would prompt them to wait, at least until after the funeral, before looking for another situation. But no, sir, they get right out. That just shows you that ingratitude is not confined to the human race.

They have their little faults of temper, too. We have not studied fleas much, but it has been observed that, if two females are put into a glass tube together, instead of laying eggs in a friendly way as they should, they rear up on their hind legs and fight scandalously.

These parasites are different from most in that they do not become parasites until they have grown up, just as the house-fly does not come into the house until it is grown up. Little fleas are the gentlemen; larger ones the ladies.

We are often invited to wonder at the extraordinary strength of fleas as compared with that of human beings. A flea can jump one foot high, which is one hundred times his own height. If a man were correspondingly strong

he could jump over the American Surety Building with the Waldorf-Astoria piled on top of it, and have a hundred feet or so to spare at that. The great pyramid of Cheops was only 481 feet high when it was new, and a man as gifted as a flea in jumping one hundred times his own height could say, "Well, so long, boys!" and hop right over it. It would be interesting, wouldn't it? I can just see a fellow shove his hat down a little tighter and give a short run and leap up into the air with his coat-tails fluttering. There's the coming down to be thought of—but that's a mere detail. If we had wings—but then a flea has no wings to let him down easy, and surely we are as good as any flea dare be. A body could get up to the Grand Central Station from down town in three or four jumps. Wouldn't it be lively in Forty-second Street about train-time, with people dropping down from every direction, with their hands on their watches to keep them from bouncing out? You'd have a clear space picked out to alight upon and somebody would walk there, and when you came down on him he would pick up his hat and growl, "Gol darn you, sir, why can't you look where you're going?" And you would say, "Oh, I *beg* your pardon. I hope I didn't hurt you. Do you know if the Southwestern Limited is on time? I was to meet some friends——" Oh, well, I guess that will never come to pass. The world's record for a running high jump without weights is 6 feet 5 5-8 inches, and for a long jump without weights is 24 feet 4 1-2 inches. The flea jumps without weights, so I suppose that is the fairest record to take. But estimating a man's height at six feet, don't you see how poorly the best that man can do compares with any flea's average performance?

But hold on a minute. Let's look at this thing before we come to a settled conclusion. It isn't quite so simple

a proposition as it appears to be. I have some sort of pride in the human race, and I hate to give right up that we are a poor lot without putting up my hands and making a few passes. When I was a boy, I wondered how it could be that a one-pound weight and a ten-pound weight, if let fall together from a height, would reach the ground at the same time. It stood to reason that the attraction of gravitation would be ten times as great on the big weight as on the little one. I could not see why it did not fall ten times faster. It would be nice if I could tell you that I figured the thing out by myself, but that would be a wicked story, told with intent to deceive. A very good friend of mine, instructor in chemistry, to whom I went with my trouble, said, "The attraction of gravitation is ten times as great, yes. But how much more has it to pull?" Ah, there was the point. Now let me tell you that that one thing taught me more than many books. In abstract reasoning, who can be sure that he has gathered together all the factors of the problem into one bundle? But the experiment will prove whether or not he has.

There is many an argument that looks sound that experimentation speedily puts a hole into. Beware the theory that fits too well. I suppose you knew all that, though, about the greater attraction having more to pull. Perhaps you knew, too, that if the flea raises its mass against its weight through one foot it will be doing no more than what a man does when he raises his mass against his weight through one foot. The flea has none the best of us, I think.

There is another way of looking at it. Plateau has made some interesting experiments as to the comparative strength of insects. He lined a narrow groove with cloth, so that the insect could get a footing. He attached

a thread to the body of the insect, passed the thread over a pully, and hung a little pan at the end in which he put sand until the insect could no longer pull it up, no matter how much it was urged with clucks and "Geet up there, Bill!" He found that a hive-bee could lift 23 1-2 times the weight of its body, while a bumble-bee, weighing four times as much, could lift about fifteen times the weight of its body. A man can lift by pulling in this way about .86 of his weight, and a horse about .35. Here is the paradox: The smaller the animal the greater its relative strength. This does not look reasonable, but it is. In the first place, it is true, and whatever is true has to be reasonable some way or other. Since strength is a matter of muscle contraction in insect or elephant, the strength depends upon the cross-section of the muscle—a plane surface. But weight depends upon volume—a cube. It is not only how tall a man is and how wide he is, but how thick through. Strength of muscle increases by squares—2, 4, 16, 256, and so on; while weight increases by cubes—2, 8, 512, 134,238,208, and so on. At that rate it does not take weight very long to run away from strength.

Now, while the flea is very much stronger for his weight than man is for his weight, it is because he is little that he is strong. If he were our size, with his structure, he would be a poor thing hardly able to stand up. It would be just as comical to think of that big lummox hopping around as it is to think of us leaping over the Washington Monument.

There have been on exhibition—it has never been my privilege to witness a performance—educated fleas, and from all I can gather the tricks they do are something wonderful—when you do not know how they are done. (I wonder what made me think of Mrs. Piper then.) It

does beat all how knowing how a thing is done can take the interest out of anything. And yet we all want to have our fun spoiled for us. The reason why it is spoiled is that, the more miraculous the trick seems to be, the sillier is the device by which it is worked and the angrier we are at ourselves for being taken by it. This, dear friends, applies not only to performing fleas, but to all things whereby the ordinary experiences of men are seemingly set at naught. We are extremely fond of being shown that after all there is no such thing as common sense, but our inquisitive nature prompts us to find out how the demonstration is brought about, and the upshot of it all is that we find out that everything is common sense.

We naturally know that fleas cannot be educated in the sense of learning Latin and Greek and the higher mathematics. We know that the smartest flea that ever was could not go up to the blackboard and work out a simple problem in arithmetic such as, Nine men can mow a meadow so long and so wide in so many days; how long would it take three men and a boy that did not feel much like working to mow a meadow six miles long and a foot wide?

Performers in vaudeville teach warm-blooded animals to do tricks that mimic human actions, and sometimes it is hard to say that the creatures do not really understand some words. But there is a good deal of petting and whipping behind all these doings. How could you pet a flea? And how would you punish a flea without killing it? While they have sense enough to carry them through most of the vicissitudes of flea life, I don't believe they have much more than that.

We know as well as we know anything that no insect was ever really tamed or taught as a dog is tamed and

taught, but when we see fleas forbear to jump; when we see them hitched up to tiny carriages and drawing them soberly; when we see some of them waltz while others go through the motions of playing on orchestral instruments; when two fleas fence with swords—well, it begins to look as if we might be wrong, after all.

But we aren't. To stop fleas from jumping they are put into a round glass-covered box, and that is spun till the fleas get giddy and stupid and bump themselves so often that they give up trying to jump. When they take a sufficiently gloomy and pessimistic view of life and say to themselves, "Oh, what's the use of anything?" then they are ready for a public career. It is pretty hard to hitch up a flea. He is a slippery customer. You can't tie a string around him and have it stay on because he has no waist to speak of, and he is very smooth. It would never do to run a fine wire through him. (Or her, rather. I believe females are most commonly used, being larger.) So a fastening is cemented to the flea's back. Fasten two of them back to back and they have to waltz. They can't help themselves, if they are alive and trying to get away. Fasten the others before tiny models of orchestral instruments and they will kick as if they were playing. If they don't, stir them up with a feather. The fencers have little swords hitched to them, and in their struggles it appears that they are fighting.

The really interesting thing about such a performance is the contemplation of the bother men will go to in avoiding honest, productive work. If the flea-exhibitor put all that planning and delicate handicraft into something useful, it would be worth something to mankind. The human race would be better off. The world would be the richer for it. The man would have something to show for it, but now, every time Lizzie or Jennie or

Arabella or any other flea dies, he has all that work to do over again. He hasn't even the consolation that the rest of us useless people have, writers and actors, painters and singers, our Art. He has no art.

He and his fleas are well-met. For he and they are parasites and devour without replacing.



CHAPTER V.

OF TRUE BUGS IN GENERAL.

THE reader will doubtless have observed ere this that in this book there is no formal schedule of classification of the insects described, and the least possible use of the scientific names for them, except occasionally for the purpose of showing off. Yet I would not have you think that I do not believe in that sort of thing. Entomology does not introduce terminology and classificatory schemes merely to complicate the game. It differs from chess and pinochle in that respect as in many others. Classification by orders of insects that have a certain structural resemblance is a great help, and these names that look to be so unnecessarily long are really brief descriptions of the creatures to which they are attached. Very few insects have any common names, and these have been bestowed in a higgledy-piggledy way and differ in different parts of the country. For example, the stink-bug or harlequin cabbage-bug in the South is called the "Abe Lincoln bug."

Almost the first thing I can remember is a big stack of boxes in the public square before the court-house. At the least calculation it must have been 600 feet high, and I can recall the picture of men scaling that dizzy height to pour kerosene on the wooden tumulus. It seems to me tar was put on, too. It was there some days, and then one night my father took me downtown to see it burn. Its roaring flames licked the dark sky overhead

and its heat burned my face. It was then I saw the first and the most glorious sky-rockets of my life. But I saw more wonderful things yet. I saw the superintendent of the Sunday-school of whose infant-class I was a member screaming and staggering about, snatching men's hats off and flinging them into the fire. I saw other men that went to our church, reeling and shouting and clapping their hands. I did not know then what "drunk" meant, and I could not understand why my father should be crying and laughing at the same time. He told me it was because the war was over. As I grew older I understood why these godly, pious men, who are now in heaven if anybody gets to that place, whose lips had never before been wetted with any drink more potent than the cup of remembrance of their dying Lord, should on this night have become drunken—how much with strong liquors, and how much with the delirium of joy, I know not. The war was over! The cruel, terrible war—that charmed away fathers and husbands and sons with enticing rattle of drums and the shrill whistle of fifes; that lured them with waving flags and splendid uniforms and rows of men stepping together, only, when it got them away from home, to murder them and maim them and poison them with fever—had made an end of her enchantments and was to be from henceforth only a horrid memory, and that a memory to be blotted out, if possible. "What does a battlefield look like?" I once asked a man that knew. "My boy," he answered, "for thirty years I have been trying to forget."

And then right after that, it seemed the next day or so, the bright April sunshine was mocked at by long black streamers of crape that hung from every store and house in the little town. It was not Sunday, but all the shops were shut and men stood talking on the corners. They

were crying again, but this time there were no smiles under their tears. There was one man in our town that said, "Good! Good! Served the old devil right! Ought to have been done long ago." They went after that man with a rope, and he caught the train just in time. And when I asked my father why all the bells tolled so sadly and so long he said it was because Lincoln was dead. Lincoln was dead! He sighed to say it.

That was long and long ago, and many prejudices and animosities I once had have long since faded away, but I cannot pass off everything with a smile. I was a little boy in gingham aprons when I heard those bells tolling so sadly and so long because Lincoln was dead, but even so, the grown man cannot endure to hear that sacred name applied to vermin. It is a kind of humor that does not appeal to me. I have only heard say it was thus applied. I hope it isn't so.

But here I am again clean out of the furrow, and I meant only to show how familiar names for insects vary in different parts of the country. Much more, then, do they vary in different quarters of the globe where the people speak English. Also the English names would not be intelligible to a German or a Frenchman, but the dead languages, being dead, change not, and serve a useful purpose in giving names that will be everywhere understood by scientific men.

I shall use them sparingly, and what classification I use shall be of the least possible. I have so far written of flies, mosquitoes, and fleas. Flies and mosquitoes are members of the great order of *Diptera*. They have one pair of wings. Though fleas are generally put into a separate stall with the name over it of *Siphonaptera*, because they have a sucking mouth (*siphon*), though not a sucking stomach, and are lacking (*a*) in wings (*ptera*),

yet I have classed them with flies and traced their probable relationship to flies, because there is much in their structure that resembles the one-pair-of-wings sort of insects.

There are other bloodthirsty wild beasts about the house, but to consider them rightly we have to take a glance at another order, the half (*hemi*) winged (*ptera*) or *Hemiptera*, which modern entomology classes as true bugs. Now that is a name we apply to almost any small boneless living creature. Physicians jokingly speak of microbes by that name. In common conversation we call it a "ladybug," but, if we are going to be accurate, it is really a beetle. And the gray thing that lives under damp boards and curls itself up into a ball, which we call a "pill-bug," and which negro nurses give to women in child-bed to swallow, is even farther away from a bug, being a kind of shell-fish gone astray from the sounding sea; a pitifully degenerate descendant of the fine old trilobites whose beautiful fossils, nearly two feet long, we used to pass around in geology class for inspection.

Speaking of degeneration, the name "bug" itself is a melancholy example of the reverses of fortune that come to words, for man that made them is lord over them and hath brought down the mighty from their seats and exalted them that were of low degree. Thanks to Max Müller, the pleasing fantasy is yet believed that nearly all the nations from Ireland to India are of one blood, because a family resemblance can be traced in their speech. It was confidently asserted that from somewhere in the table-lands of Persia successive waves of immigration rolled outward, each wave pushing its predecessor before it. You remember that in the last chapter I bade you beware of theories and explanations that fit too well and look too reasonable. After the first enthusiasm, people

recalled that though American negroes speak English, yet they are not quite what you might call Anglo-Saxons by race. The Jews speak European languages, but they are Semites, not Aryans. Language is no criterion of race. Well, it's a long story, but the amount of it is that it is now tolerably well settled that while Europeans are a mixture of several peoples, their language probably had its origin in the plains of Russia. The ancient Scythians probably spoke very nearly that tongue from which branched off, like branches of a tree, Greek, Latin, Persian, Sanscrit, German, French, Icelandic, Gaelic—all the languages of Europe except Basque and Hungarian. Herodotus has preserved almost the only Scythian word we know, and that is the name for their God, "bagaios," of which we may take the "os" to be a Greek addition. In the Russian Church liturgy to-day the word for Almighty God is "Bogu." In this instance Christianity took over the name to its own use, but in others new words of Latin origin were substituted and the old gods were denounced as devils, and their customary offerings were forbidden, so that they shrank in size from starvation and became "little people." These godlings were "fairies" if they were light-colored, and "brownies" if they were dark. Housewives (who have never really been converted to the new religion, I don't care what you say) still made little offerings to these household deities to keep them in good humor. As "pucks," they played tricks on slovenly and stingy housekeepers. Also they scared folk as "spooks" and "pookas." They were "bogies" and "boogers" and "bug-bears" and "bugaboos." It was they that made nightmares and wakened one trembling with nameless fright. Our Authorized Version says, "Thou shalt not be afraid for the terror by night," but the Bible of 1551

has it, "Thou shalt not be afearde for any Bugge by night," and though Shakspeare uses the word "bug" six times, it is always in the sense of something fearsome.

Many changes were taking place in those golden days of good Queen Bess. For one thing, men were not, as before, believing everything that was told them. The awesome thing (*bug*) that came in the night (*hom*) was found to be but "humbug," which is what the occult will be found to be whenever you get a good look at it by daylight. They are all "bogus." Yes, Mrs. Piper, too. She is born, but she is not buried yet. Some day it will all come out. You'll see.

Another change was that England was trading with Southern countries and bringing back many things hitherto unknown—sugar and spices, and in the same ships, though not on the bill of lading, troublesome pests that lay hid in the crannies of the wall by day and trooped into the beds when darkness fell. They were an old song to the Italians, but new and fearsome to our English ancestors, truly terrors by night. There was no English word for them, but the rationalizing spirit of the age, with that verse of the 91st Psalm in mind, made a good joke and a good name at one blow.

But what a come-down! For a word that had once been the synonym for the highest existence man can conceive, to sink down through the occult, the feared, the distrusted, the false, and the lying until it scraped on the bottom mud as the synonym for the most loathed and despised of living things! There is a lesson in this.

In modern entomology the word bug has been taken for the especial description of such insects as have their beaks formed for piercing and their stomachs acting as automatic pumps. They are blood-suckers, as are all that trade in the supernatural. They do an incalculable

damage as an order. The phylloxera, that nearly ruined France's vines, and cost her far more than the indemnity she paid to Germany for the Franco-Prussian war, is a bug, a plant-louse.

The powers of reproduction of plant-lice are simply beyond the mind's ability to conceive. Huxley, rather underestimating than overestimating the numbers of their offspring, computed that the uninterrupted breeding of ten generations from a single ancestor would produce a mass of organic matter equivalent to the bulk of five hundred million human beings. Take all the people living in the United States and pile them in a heap. Seven such heaps would not equal the progeny of one plant-louse. All their bulk comes from vegetation, and the more the world comes under cultivation the greater the amount taken from garden stuff as compared with weeds and wild plants that have no economic value. That mound seven times as big as the population of the United States would represent nothing but stealings, waste.

From a single ancestor, Huxley said. How can that be? Why not a pair? Because for generations there are no fathers or brothers.

Take for an example the hop-plant louse, that certainly has done all in its power to ruin the hop industry. There are generally plum trees to be found near hop-yards. On these the aphids put in their time while waiting for the hops to come up. An egg hatches out a wingless female. In two or three days this stem-mother, so to speak, brings

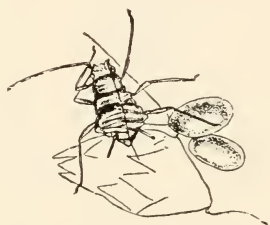


Fig. 14. Winter eggs of the hop-plant louse, and shriveled skin of the sexual female that laid them.

forth living young, all females, and continues during her life-time to add to her family from two to eight daily. These in turn become mothers when eight days old.

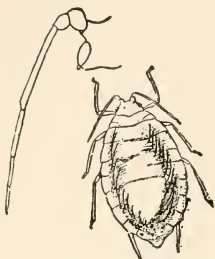


Fig. 15. The stem-mother of the hop-plant louse; enlarged antenna above.

The stem-mother may live to see her great-great-granddaughters.

By the time the third generation appears the hop-vines are up. They must get at them, so this third generation of virgin-born females, cleverly enough, comes out in wings and takes flight to the new field of operations. There they jab their beaks into the plants and suck the juices automatically. Every once in so often, as if actuated by a common impulse, they tilt themselves up on their noses and discharge a shower of sweet liquid from glands in their abdomens. Ants are very fond of this liquor. By the time hop-picking is well under way, wings that had been as out-of-date as puffed sleeves are with us, come in again and are all the rage. It is about time to get back to the plum tree. Later in the season there is a generation exclusively of males. They set the sponge, so to speak, of next year's baking and perish.

I am reminded in this connection of the famous saying of Michelet that so wise is the governance of this world that the most destructive insects are those most relished by birds. This sounds a good deal as if he had had to say it in order to hold his job in some small denominational college, where the professor of geology has to keep his mouth shut about the doctrine of evolution. It would be ever so nice if it were only true, but I never heard that the French birds got very fat eating the phylloxera, or if they did they could not keep up with

the increase, for, when at its worst, the pest destroyed some 2,500,000 acres of vineyards, representing an annual loss in wine products of the value of \$150,000,000.

Birds do not generally care much for true bugs, for, as a rule, their main defense is a very pronounced odor. A creature that does not escape discovery by mimicking its surroundings has only to make itself taste nasty to birds

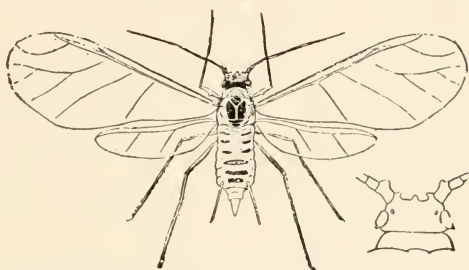


Fig. 16. The hop-plum louse, third generation on the plum tree, the one that flies to the hop vines; enlarged head below.

to be let quite alone by them. However, other insects are not so particular, and the syrphus-flies and lace-winged flies (these latter themselves by no means suggestive of roses and violets) will very effectively clear off the plant-lice if they give their minds to it. The little *vedalia*, imported expressly to eat up the San José scale insect, did its work very thoroughly.

Some bugs smell like ripe pears, and the coreids are said to be aromatic like cinnamon. I shouldn't wonder if there was money in raising coreids for cinnamon essence. The cochineal bugs used to be very good for red dyes before aniline came in. The *coriara* bug lays such enormous masses of eggs on the lakes near the city of Mexico that they are exported by the ton into England to feed song-birds and poultry. The Mexican Indians make a cake of these eggs. They say it has a pleasant acid

taste. I don't believe I'd care for it. It may be mere prejudice, but I guess I can stagger along without eating cake made of bugs' eggs. This *corixa* has a long snout, and plays on it with its forelegs. I don't suppose it can carry a regular tune, like "Juanita," or "The Holy City." It would be rather nice if it could, wouldn't it? Rich folks could have their *corixa* imported from Mexico and keep it in a cage and go up to it and say, "*Corixa! Corixa!* Tweet! Tweet! Can't you play a nice little air for the lady?"

These seventeen-year locusts, which are not locusts, but bugs, are musicians in their way. They do not fiddle, but make music by bending in and out a sort of drum,



Fig. 17. The hop plant louse, male; the only husband and father for a score of generations.

as one works the bottom of the sewing-machine oil-can. I used to think that the story of their appearance only once in seventeen years was cut off the same bolt of goods as the accompanying yarn that you could tell whether or not their intentions were peaceful by looking on their wings. If there was a letter W there, you might know they had come to make trouble. But if, on the other hand, they had arrived at the conclusion that we had

behaved ourselves pretty well and they were going to let us off light, there would be a large capital P in its stead. Now, even as a boy, I had my grave doubts as to whether these bugs were familiar enough with the English language to write it, and though there was a very small crop of them and they did no particular harm, I could not find a P on any of their wings, though I sought it carefully. They always wear a W, though as a matter of fact they do comparatively little damage any year except that the twigs in which the female lays her eggs are weakened by the borings and break off in a high wind. But it is true about each brood flying in the air only once in seventeen years, though in the South, where they expect trouble to come a little oftener than in the North, there is a thirteen-year variety.

After the grubs hatch in the pith of the twig they crawl out and let go, hoping that it won't be much of a bump, a confidence not generally shared by the six-legged tribe, whose members, if they must drop to the ground, do so on the end of a line, paying it out as they descend. The grubs bore into the earth and live on the vegetable moid about some root till the time comes for reappearance, when they make a mud chimney and come out in a new suit of wings. They fly up into the tree-tops and work their drums like oil-cans to make a joyful noise. They mean it for a love-song, but the wasps constantly mistake it for the dinner-horn. A wasp considers a seventeen-year locust—or harvest-fly, to give it its right name—very fine eating; a little awkward to carry, perhaps, but well worth the trouble. The different



Fig. 18. Hop-plum louse, the true sexual female.

broods of the harvest-fly are pretty well mapped out as to habitat and date of reappearance. From the fact that its numbers are decreasing so rapidly my natural tendency to take a gloomy view leads me to suspect that it is of great benefit to the human race, if we only knew it. I have no other ground for supposing so, unless it is that this is about the only insect that the English sparrow will eat. I tell you that looks mighty suspicious.

Before I leave bugs in general and get down to bugs in particular, I really must speak of the *saitha*. The male carries the eggs about on his back until they hatch. Isn't that sweet of him? Shows he is a good family man and takes a large fatherly interest in the welfare of his offspring. Good old *saitha*! But wait a moment. As the Irishman says in vaudeville, "'Tis not because he wants to, but because he has to." He has a wife.

"Henry," says she, "I have some eggs for you to carry. Just let me put them on your back, dear."

"Well, really, Emmeline, I don't like to seem disobliging, but you must excuse me. It seems to me you are asking a great deal."

"Dear, I wish you would. Only till they hatch, you know."

"Well, I like your nerve. I see myself—I just see myself toting eggs on my back. Huh! What do you take me for, I wonder?"

"Oh, pshaw, now; don't be foolish! Other bugs do it, and I don't see why you shouldn't."

"Yes, they do. And what kind are they? I s'pose you want me to be like that milksop of a thing on the next leaf. His wife's got him so he dassent say his soul's his own. Everybody's laughing at him."

"Now look here, sir, are you or aren't you going to carry those eggs?"

"Well, if you want a plain, straight answer, I'm not. You can just put that in your pipe and smoke it."

"We'll see about that, sir. You come right here to me and hold still till I put these eggs on your back. Aw, Henry, won't you? Won't you, please? Please, Henry. You'll look so nice with 'em on."

"Huh!"

"You have no idea how 'cute they'll look on you. Won't you, Henry? Just try them. . . Henry!"

"What?"

"Won't you?"

"Won't I what?"

"Won't you let me put these eggs on you?"

"No, I won't. I told you I wouldn't and I won't. Now that settles it. I don't want to hear any more talk out of you about it."

"You said you would."

"I didn't."

"Oh, yes, you did! You promised you would."

"Why, Emmeline, what's the use of your talking that way? You know I never said any such thing."

"Oh, Henry! 'Deed and double you did. I never thought you would go back on your word that way."

"When did I say I would? Tell me when. Just tell me when."

"When you were courting me. You said——"

"O-oh, *well*, but you know——"

"I know that you promised me faithfully that you would tote eggs for me whenever I asked you to. And I says, 'Yes, they all say that when they're courting. How do I know but you'll back out when the time comes?' And you says, 'Emmeline, I swear it! By yon fair moon I swear it!' Now, aint that just the way it was? Why don't you answer me?"

"Well, I aint a-goin' to, and that's all there is about it."

"Well, you are, and *that's* all there is about it. You can't back out of your promised word——"

"I won't carry eggs for you nor no other bug. I'll see you——"

"Hen-ray! Don't you da-a-re swear at me! Now, sir, you might as well understand that I've put up with your rowdy talk and slack ways all I'm going to. I'll show you. What? You dare raise your hand to me? Take that! And that, you brute! And that and that and that and that and that and that and that——"

"Help! Help!"

"Yes, you coward, call for help, will you? I'll help you! I'll help you! Here's help and here's some more! and here's some more and—raise your hand to me, will you? I'll show you. Take that and that—Oh, you'll carry them, will you? I thought you'd see it was your duty. Now hold still. . . If you move another time, I'll clout you good. Now remember. . . Yes, there's only a few more. . . There! That's done and a good job too. . . Aint you glad you helped me? Oh, they do look lovely on you, Henry! Why! Did I hurt your poor eye? Oh, dear, I didn't go to. I'm sorry, but you know you—— Come here, sir. Come here to me, I tell you. What were you trying to do just then, when you thought I wasn't looking? Eh? Answer me."

"I wasn't doing anything."

"Don't you story to me. You thought I didn't see you, but I did. You were trying to scrape those eggs off, weren't you? Now, sir, you just dare to *try* to scrape one egg off, and do you know what I'll do to you? Do you?"

"Yes, ma'am."

"And will you ever?"

"Yes, ma'am—no, ma'am, no, ma'am, no, ma'am. I won't. I won't ever do so again, if you don't lick me this time."

"You'd better not. Now mind. I know just how many eggs there are, and if I find one gone—there'll be trouble, do you understand?"

"Yes, ma'am."

With the exception of the actual wording of this dialogue it is a true and faithful account of the event. I have condensed the struggle, but it sometimes lasts for hours before the male surrenders. After this Appomattox he watches his chance to scrape off the constitutional amendments (with his own and not his grandfather's claws), and, failing in this, he sulks and mopes. A very lively bug naturally, when disgrace and shame are thus put upon him openly, he seems to say, "Welcome death!" If some other bug comes up to him and steps on his foot or slaps him down, he doesn't take it up. All the pluck is clean gone out of him. What a lesson! What a lesson to the wives of America! Ah, ladies, you little think what irreparable mischief you are at when you make your poor husbands crawl out of a warm bed on a cold morning to light the kitchen fire, or when you interrupt them, when they are reading the paper, with unreasonable requests for a bucket of coal or—but I forbear to put new devilment into your head by suggesting other chores that perhaps you hadn't thought of. It were a poor exchange that gained a few paltry armfuls of kindling and lost the aggressive, dominating manhood of the race!

As I was saying before you interrupted me, the bed—
But suppose we begin another chapter.



WE NEVER SPEAK THEIR NAMES.

ONE may marvel at the terrible downfall of the name "bug," which started out so bravely, perhaps may even pity it (if pity can extend to a vocable—a collocation of sounds more evanescent than a bubble and yet more lasting than any other of man's works, for what monument endures through ages like the spoken word?), yet the wonder must not be as for a freak of nature, a thing that breaks the common rule. For there is but the thickness of a fly's wing between dev-ilish and div-ine, between "Deus" and "the deuce," between praying and cursing, sacred and execrated. Stop a moment. Close this book and bethink you: What is the holiest thing on earth? What is the wickedest thing on earth? What blesses and ennoble and purifies mankind and draws it through the centuries nearer and nearer unto God? What blights and degrades and poisons mankind, body and soul, and drags it down below the level of the brutes? The Fount of Life, the Road to Hell, what is it? It is Love, a thing so precious that the best of men may question if they truly know it. It is Love, a thing so common that the soddenest loafer knows it but too well. It is both sacred and accurst. All our novels and our dramas treat of

Love, yet no one dares to write a real love-scene. The church-spire points the way to Heaven, but, in the last analysis, it symbolizes what decency forbids the mention of, and the sacred emblem that it bears aloft, the cross, is such a sign as naughty little boys might chalk up on a wall.

So, then, it must needs be that those living things we do not mention in polite society should have a link to join them with what is sacred. For sacred things are "taboo," and the "taboo" upon these creatures, like any other, works for the ultimate benefit of the race. Speak to my people that they go forward, saith the Lord God, and to be the host and victim of these parasites is to lag behind in the march of progress from the wilderness of savagery to the Canaan of real civilization.

For all things thus taboo there is a wealth of names. As fast as one euphuism becomes so familiar that no mental effort is required to understand it, another

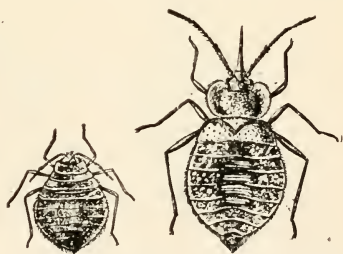


Fig. 19. *Acanthus lectularia*, or common mahogany, or chintz, or "b flat," or Norfolk-Howard.

must be invented. The particular beast I speak of now is called in New York a "red-coat," I suppose partly from its color and partly as a relic of that patriotism which, in Revolutionary days as now, gave to contemptible pests the names of political foes. As far as I read history, this was about the limit of New York's patriotism at that time. In Baltimore it is called "mahogany flat," which describes color and shape. In Boston, it is called a "chintz," which is the word "chinch" in tolerable preservation. The chinch-bug has exactly the same per-

fume and boasts the proud distinction of being the costliest bug in America. In some years the grain-growers of the Middle West have been out of pocket as much as a hundred million dollars on account of it. Even so, I think its near relation costs more in blood and mental anguish. The name of "Norfolk-Howard" I will explain later in the chapter on Cockroaches. I deem it a very genteel appellation, but the prize for quaintness I think attaches to "B flat." I was puzzled about the origin of this until I came to write it down as one would in music—"Bb." Then I understood. Not only does the italic *b* stand for flat, which the insect certainly is, but it and the

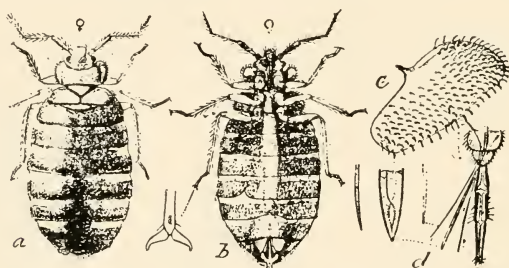


Fig. 20. *Acanthus lectularia*, male and female; the terror by night, and its instruments of torture.

capital together give the initials of the—— I came as near writing the word then as anything could be!

As far as its bite is concerned, I really believe its bark is worse. The beast does not inject any poison, though with some people the skin gets red and itchy where it bit them, and of course it is entirely possible for it to transmit infection, though I do not know of any such reported cases. As the ladies say about mice, "It isn't the mouse itself. It's the thoughts of it." So when one wakes up some night in March in the midst of a dream that he is out on the front stoop and that the mosquitoes are very

thick, and his reason tells him that it can't be mosquitoes yet, and the sense of hearing assures that nothing is flying around claiming kin with him, "cousin-n-n-n, cousin-n-n-n-n," and he slaps his arm and hits something that is not his arm or the sleeve of his pajamas, and still another sense tells him that it is not mosquitoes, but a different bird entirely, it is not the mere chagrin of losing blood that vexes him, nor the pain that angers him, but the shame that comes to him, the blush that even in the darkness suffuses his face at the thought, "What would folks say if they knew?"

When I was a boy and lived in a detached house, only low trash had such things about. I do believe that, if my mother had found one, she would have keeled over in a dead faint. People that live in their own separate dwellings to-day pass their lives from infancy to old age without seeing one, much less being bitten by one. Nice people, I mean. But you may be as neat as wax and as particular as all get out, and if you live in city flats there'll come a time some day when you'll go to the drug-store and lean over the counter and whisper in the druggist's ear. If he says, "This 'll fix 'em all right," and says it a little too loudly, so that the lady waiting for her car hears and smiles a little, you take your patronage away and buy your postage stamps thereafter from the druggist on the other corner. That is, you do at first. After a while you get desperate and reckless, and if anybody looks curiously at the bottle with the skull-and-crossbones label, you look back at him, boldly, impudently, as much as to say, "Well, what of it? You've got 'em at your house, too, only you don't make any effort to get rid of them."

It is all very well to say that if there wasn't "tacky" housekeeping the things wouldn't be there, but if you

live in a flat it may be that you are not the first tenant. If you want to gain a poor opinion of people, just take their flat when they move out. It may be, too, that somebody in the flat overhead or the flat beneath is afflicted with them. They come in by way of the water-pipes. Maybe they were in the van in which your goods were moved. Maybe they came in on the old cloths the painters put down when they re-decorated the place. There are a thousand ways by which they enter, and they know them all and more too. Oh, they're cunning! They don't ring the bell and shout up the speaking-tube to let you know they've come to pay you a good long visit. The first hint you have that Pa and Ma and Aunt Allie and Uncle George and all the children have come and brought their trunks is when you begin to dream of mosquitoes. From that time on there is trouble.

It used to be that everybody had wooden bedsteads, with beautiful big head-boards carved nicely and made in several panels. They are not so much in style as they used to be. In fact, if you try to sell one to the second-hand man he will pay you kindling-wood prices for all that lovely carved wood, and not a cent more. The trouble with the wooden bedstead was that it was one of the most carefully planned places imaginable for B flats to play hide-and-go-seek in. You need not count a hundred, but say right off:

“ A bushel o' wheat,
A bushel o' rye ;
All that aint ready
Holler 'Nay, I!' ”

and you would never hear a B flat even cheep “ Nay, I! ” because they would all have found a place where you could not spy them. And as if there weren't cracks enough naturally, the cabinet-makers used to bore two

little holes in the legs of the head-board for no other reason that I could ever discover than to make nice nests for the pests. Right cozy they seemed to be.

The morning after you dreamed of mosquitoes, or anyhow the Sunday morning after, you took the bed down and there, on the underside of the side-boards, you found bunches of eggs. They are 'cute little things, with a kind of lid on the top for baby to push open when he first peeps out on the big, wide world. You smashed them too quick to appreciate their beauty. You took this stuff you got from the druggist and brushed it into all the cracks in the bed. You went all over it carefully. You let none escape.

"Well," says you, "that's a good job done. They say: 'Cleanliness is next to godliness,' and even if I did miss church this morning, I guess it's all right."

"I'm so glad we went for 'em before they got the start of us," says your wife. "There's only a few of them—now, but if they got ahead they'd have eaten us up alive. Mercy, aint it awful!"

You live in a fool's paradise for a while, but one night when you come home to dinner your wife says, "What do you think I found in the bedroom this morning?"

You stand aghast.

"What! With all the going over I gave them Sunday?"

"Yes, sir. As true as you live."

"Good land! Have I got to take that bed down again?"

You do take the bed down again, but this time you take a look at the mattress. All along the edges there are—well, they're there. Your wife screws up her nose and, overcoming her feelings, slaughters like an Apache.

"Oh, Arthur!" says she a thousand times, "I'm just

sick at heart," says she. "What do you suppose Ma would say if she saw this bed?"

I tell you it makes a man feel terribly guilty to realize to what depths of degradation he has brought his innocent young wife, a girl that never in all her life before associated with a b—a B flat, I mean.

This time you slather on the skull-and-crossbones stuff. And still you dream of mosquitoes.

"Ah, it's no good," you say. "The druggist's a fraud. I believe it's nothing in the world but stale mineral water he works off by putting a Poison label on it."

You buy insect powder and sprinkle it between the sheets. It looks like corn-meal and feels like corn-meal, and you feel mortified to have it about. Besides, it does no good.

You get desperate. Hand-picking, distasteful as it is, after all is the only sure way, you begin to think. One B flat meets another and stops to pass the time o' day. "Weil, what's the news down your way?"

"Oh, nothing startling! Old Reuben got killed accidentally yesterday. Kind o' childish he was, you know, and whilst Sarah Ann was busy about something or another and couldn't look after him, he wandered out and got ketched. Poor old soul! I kind of feel sorry for him. Smashed up something terrible. Well, we've all got to go some day, I s'pose, and old Reuben was a shock of corn fuily ripe. Your folks all well?"

"Well as usual. One of the children had a bad coughing spell the other night. Got some of this powder that's been so bad here lately; he got some of it into his wind-pipes, and it irritated them quite some. His ma was real worried about him for a spell, but he's all over it now."

"I hear they's considerable sickness up toward the head end of the bed!"

"Oh, nothing to speak of! Some miscreant sloshed a little poison around, but wa'n't nobody hurt, I guess. Mustn't mind a little thing like that."

You and your wife try everything. You varnish the bedstead over, so as to seal up the eggs. You pour hot water into all the cracks and crannies of the bedstead. You soak it with kerosene. You soak it with benzine. You buy new kinds of stuff with a skull-and-crossbones on it. Waste of time and money.

"There isn't one bit of use trying to get rid of them," says your wife, nearly worried out of her mind, "as long as we keep those wooden beds. They're just a harbor for them. I won't stand it any longer. Now how much do you suppose the second-hand man will give me for them?"

You don't know; you think not less than so much. That is before you try to interest him in the undoubted bargain you have up at your house, if he will only come and have a look. Your wife shows you the department-store advertisements in the Sunday paper, and you tell her to go ahead and buy the enameled bedsteads, and you'll stop in at some second-hand stores on your way to the office.

It is a sad story this, about the second-hand dealers. Myself, I think they are a greedy and a grasping lot. But a whole book would hardly do justice to them and their ways, and I must hurry on. The upshot of it is that you are ready to weep tears of joy on the collar of anybody that will come and take the wooden beds out and away. Anything to get rid of them.

"Now," says your wife, after the new beds are set up, "now we'll have some peace and comfort, I hope. Don't they look nice? I ought to have got new mattresses, I suppose, but the iron beds they advertise for \$3.98 I

wouldn't have for a precious gift, and these took so much of my money that we'll have to use the old ones. I hated to throw them away. They are as good as new, and I went all over them carefully with corrosive sublimate."

"Well," says you, "they won't cuddle down much in the cold iron cracks in these beds."

And that night you dream of mosquitoes again.

Just about then it dawns on you that a creature that has lived with man for so long, that lives exclusively in man's houses and gets its growth only by sucking man's blood, must have accumulated some little wisdom and understanding of his ways. If it is to bite man at all it must bite him when he is sluggish with sleep, and in the dark, when it is easy to hide. The broad daylight, when man is wide awake and his keen eye can detect the smallest creature moving on the white sheets, is no time to frequent the bed unless one would court death. Only the feeble-minded and the heedless are captured so. When day breaks they forsake the scene of their nightly revels and betake them to the crevices of the wall, and in the mattress wherever they can find a place between stitches through which they can slip their thin, flat selves. Get at them? Not with powders and liquids.

I'll tell you. Take a Sunday newspaper and cut it into strips about two inches wide. Get some sulphur from the drug-store. It comes all ready to light for disinfecting purposes. Put it in a pan, and set that pan in a bigger one that has water or loam in it. That is so you won't set the house on fire. Get some molasses and paste the strips of paper over the cracks of the windows that communicate with the outside air. Mind you do this, else will your labor be but in vain. Pour a little alcohol on the sulphur and the wick in it. Touch a lighted match to it

and get out of the room. Shut the door behind you and seal it up all round, key-hole and all. Let it alone now for three or four hours. Better say four.

Pasting it up with molasses helps you to strip off the paper and wash it off afterward. Flour paste leaves the place looking like distraction. You will have a terrible time getting to the window and raising it to let the fumes out. Sandow couldn't raise it with the papers stuck on it. Take a case knife and cut them through. It will make your eyes smart and you will cough for hours afterward, but even if you do tear off a yard or so of your lungs, think what it does to the B flats.

When the air clears enough to let you go in and look, you will be astonished. It is Martinique over again without the ashes, and you will find them in windrows, where they died gasping for breath. You have no idea how many there are. That little place in the mattress that you soaked with kerosene and death's-head stuff—why, they came boiling out of there in frantic haste, barking and snorting and rubbing their eyes, only to fall over with a grunt. You yourself will go to sleep coughing for a week, but you will not dream of mosquitoes. It is worth the coughing, for it means freedom forever, and if you want to make freedom absolutely certain repeat the operation in a fortnight. But a good big lot of sulphur and a room well-sealed does the trick. Also, if there happens to be a dear little mouse in there, you need never set the trap for him again. (Now don't you go and tell everybody that this is my own personal experience. I wouldn't have it get around for the world that there ever was such a thing in *my* house. Just make out that you thought it all out for yourself. You knew it was good for scarlet-fever germs and diphtheria-bacilli and such, and, thinks you, "Why wouldn't that do for—you know what?" So

you tried it, and it worked like a charm. Just keep me out of it, please.)

This true domestic animal, found nowhere else than in man's houses (though perhaps it is a cousin that boards with the pigeons), has acquired the convenient power of subsisting almost indefinitely without eating. It does not like to do so, for it often deserts houses that are too long vacant and moves to where things are a little livelier and it can get a bite occasionally. Once the migration gets started, it sometimes continues for months. However, houses long empty of tenants, or deserted camps in the woods, are soon found by newcomers to be all alive with them, ready and even anxious to resume business at the old stand. What they have done in the meantime is simply to wait. It takes five meals to see them from the chick to the mature fowl. They eat, and it swells them so their clothes rip open. Never mind. They have another one on underneath and they step out, all ready for Easter. If they don't get a meal they don't get any older. One specimen has been kept in a bottle for a year without food and at last reports was enjoying reasonable health. It is as if you, Master Willie, were to continue to be only ten years old the rest of your life, provided you took the pledge against eating. The female lays her tiny eggs (from six to fifty is considered a clutch) and in eight days they hatch and push off the self-sealing lids. There are no violent transformations, as in the case of other insects. The delicate yellowish infant grows only darker with its five meals and five molts, except that at the last it puts on wing-pads to show that though now it seeks safety by hiding (and it is a mighty small crack it cannot get into), there was a time ages ago when it flew. To make the proof still stronger, there are occasional freaks, reversions to type, that fly, and they

say—I do not know how truly—that in the Orient there is a winged species. But the common creeping kind manage to get about plenty fast enough. It was very likely a plant-feeder in the early days, but on what plant is unknown. Probably it is out of print by now. Some have fancied that the wild bugs live on the cottonwood tree and the Georgia pine and are brought into the house by the use of these woods in carpentry. But it is the immature young of quite another insect that at one stage resembles our flat mahogany friends, which are old-world importations. The Indians never knew them until European civilization, with its train of attendant benefits, reached these Western shores.

A man once called up Dr. Abernethy in the middle of the night. "Doctor," he cried, "Hodges has swallowed a mouse. What shall he do?"

"Tell him to swallow a cat!" snapped the physician, and went back to bed.

Something like this prescription is the statement that the common

red ant will exterminate the B flat. They are many times smaller than the bugs, but it is said to be most delightful to see them chase them out of cracks and crevices, tear them limb from limb, and carry them off. Then the next question is, what are you going to do with the red ant?

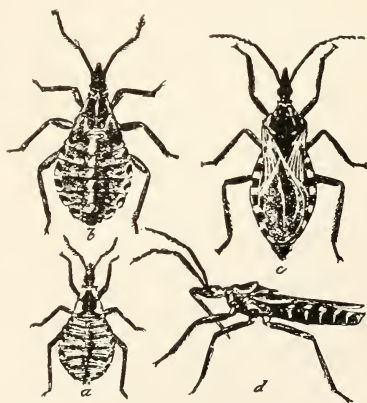


Fig. 21. *Conorhinus sanguisuga*, blood-sucking cone-nose; the kissing-bug.

Quite a fuss is made from time to time about the "kissing-bug," which bites pretty girls on their ripe red lips and hurts like the mischief. Also it makes the victims' faces swell up till they look like the faces on the doughnut men that grandma used to throw into the hot fat for us long time ago. (I hear that in some parts of the country grandma still does that. She's a real nice relation, grandma is.) Well, this kissing-bug has a hard name that means blood-sucking cone-nose. It gets into the beds sometimes in the great South-western country, and it is truly a biter from Bitersville. When it jabs in its beak it fairly spraddles itself out and takes solid comfort as well as liquid food. Victims lose the use of their limbs for two or three days sometimes. But the blood-sucking cone-nose lives out of doors and only flies into the houses at night. They have not yet come to live with man, and so long as there is such a thing on the market as wire gauze it is not probable that they will.



Fig. 22. *Pediculus capitis*, the head-louse.

And now we come to another kind of bug that sucks blood and has lost its wings and is thoroughly domesticated. If I was too bashful to come right out with the name of the terror by night, I am downright ashamed even to have to hint that these other things exist. And yet to be ashamed is really something to be proud of. There are some pretty good poets nowadays as poets go, though they are all a trifling lot, but not one of them would dare do what Robert Burns did. We have progressed a long way since he penned that clever poem about what he saw crawling on the lady's neck that sat in the pew in front

of him at church. I suppose it was considered a good joke in those days, but now just to think of it gives you a creeping feeling at the roots of your hair. B-r-r-r-r-r!

They have long fleshy beaks that turn inside out like a stocking and jab into a sweat-pore. Once they strike the blood the natural peristaltic action of their digestive tube keeps up the pumping. Their eggs are glued to the hairs and the infant, when hatched, is like the adult, except in size. They try the best they can to match the color of the skin of the person they live with, white man or negro or whatever.

One kind stays in the hair of the head, another kind in the clothes, and still another kind has claws like a crab, and hangs on to a hair as if it grew there. For all these what an old Irish lady I once knew called "Ann Quinlan," and what the druggist calls "unguentum mercurii," is said to be a good remedy. Monkeys have a picturesque and economical method of ridding each other of them. In case you are inclined to be proud of your family and to brag about the three brothers that came over in 1640 and so on and so on, let me tell you that you do not have to go back much further than that date to find ancestors that did the very same trick as the monkeys. When the body of the martyred St. Thomas à Becket was laid out for burial a contemporary says the saint's haircloth shirt "seethed

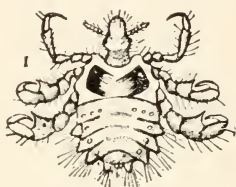


Fig. 23. *Phthirus inguinalis*, the crab-louse.

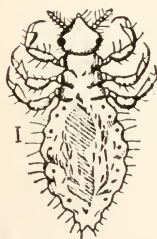
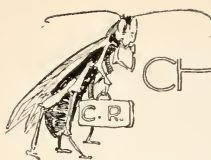


Fig. 24. *Pediculus vestimentis*, the body louse.

like a boiling pot " with them. Thomas à Becket was Archbishop of Canterbury and chancellor of England. He put on more style than the king himself, and yet the lowest modern tramp would be ashamed to let himself go like that.

Folks and friends, let me tell you something. The past is only good to mark how far we have got above it. It isn't our ancestors we should be proud of, but our posterity. True, we can tell from whom we are descended and their noble deeds, and we cannot tell what illustrious men and women of coming ages shall be the fruit of our loins, but we can do the best we can to see to it that at least our immediate descendants are clean and wholesome, right-minded and right-bodied children.

P. S. This has been a terrible chapter to me, and I am glad I got through it as well as I did.



CHAPTER



VI.

THE ARISTOCRAT OF THE KITCHEN.

IF the test of nobility is antiquity of family, then the cockroach that hides behind the kitchen sink is the true aristocrat. He does not date back merely to the three brothers that came over in 1640 or to William the Conqueror. Wherever there have been great epoch-making movements of people he has been with them heart and soul, without possessing any particular religious convictions or political ambitions. It is not so much that he approves of their motives as that he likes what they have to eat. Since ever a ship turned a foamy furrow in the sea he has been a passenger, not a paying one certainly, but still a passenger. But man himself is but a creature of the last twenty minutes or so compared with the cockroach, for, from its crevice by the kitchen sink, it can point its antennæ to the coal in the hod and say: "When that was being made my family was already well established." There is good reason to believe that the cockroach is the oldest of air-breathing animals. From the rocks we do not know half a dozen insects of other kinds, but the cockroach is visible on every geologic horizon.

It has seen the most promising organisms enter the world's history, flourish mightily for a time, and with as firm a conviction as any newspaper in a boom town that they had "come to stay," and then pass away after having tried all manner of variations in the effort to accommodate themselves to circumstances. They couldn't seem to make it pay, but the cockroach has got along all

right without having to resort to any catch-penny devices or circus methods of advertising. It has stuck to its type of the Carboniferous era, believing that what was good enough for its great-grandfather to the *n*th power is good enough for it, and satisfied that it is about right, as the true conservative should be. I can imagine that they have an amused interest in the struggle of other creatures to make a living, and that one meeting another might say, after exchanging the compliments of the season: "I seen *Macropetalichthys sullivanti* the other day."

"Did you? How is Mac? Getting along swimmingly?"

"Well, I dunno. Looks like to me he wasn't makin' much of a go of it?"

"No? You surprise me. Thought his up-to-date methods were going to make us old fogies open our eyes."

"Oh, he *said* things was rushing. Said he was busy night and day. But I dunno. I dunno. He didn't *look* very prosperous."

"Well, I guess he'll find he can't come in here and upset everything quite so easy as he figured on. Old-established community like this don't take up with new ways in a hurry. Nice weather for this time o' year, aint it? You just watch out and you'll see the sheriff 'll close him out yet. Sorry for Mac too. Nice fellow, Mac is, well-meanin' and all that, but law me! too—too up-and-comin', 'most, for a new arrival. Ought to kind o' set back and keep still for a couple million years or so. Well, I'll be goin' along. Why'n't you come up and see a fellow once in a while?"

The sheriff did close out *Macropetalichthys sullivanti*, and I don't know how many else besides, and those that survive have often succeeded in hanging on only by

making the most radical changes in their business methods. Almost all other insects have been compelled to adopt strange shifts, each in its lifetime. They come out of the egg as grubs and water-wigglers. They try that for a while and then go into a trance to think over what they will do next. When they emerge it is a kind of last act of Uncle Tom's Cabin grand transformation scene, with wings and all kinds of make-up. You wouldn't know them. To the cockroach this has always seemed something too much like mountebanking, too sensational, too flash, if you please. "Once a cockroach, always a cockroach," is its motto and it sticks to it. Though it changes its clothes seven times in its progress from the egg to the adult and, if it be a he cockroach, puts on wings instead of growing a mustache, it never takes an alias, never appears to be anything but what it is, a cockroach. It possesses that virtue that we delight to honor in our deceased fellow-man. "Yes, yes, poor Joshua," we say with a sigh and the tremolo stop pulled out. "You always knew how to take Josh. He was always the same." It is a great thing to be steady, reliable, and unprogressive.

It has its drawbacks, I admit. The brighter the light, the blacker the shadow it casts. It is generally conceded that as insects cockroaches do not rank very high. They class with the locusts, grasshoppers, and crickets, a stupid lot. It was, perhaps, unfortunate for them that they succeeded so soon. To jump right into prosperity seems to a young man to be the best thing imaginable, but the chances of that young man growing and broadening after he has found out what will please are very slender indeed. After a man has caught the car he no longer runs and shouts and waves his hand, putting forth great energy and attracting the attention of everybody

except the conductor. He sits down and becomes uninteresting, after that. It was a great thing that the Chinese should so early in history have invented an ideographic system of picture-writing, that was a great deal better than no system at all; but that early success has made their literary intercommunication with the rest of the world impossible. That and the virtue of our friend Josh that was always the same, no matter when or where you found him. Not only nations, but individuals, have paid terrible penalties for succeeding too young. There is one writer in particular—but no, I will not join the pack of jackals that yap at him. He may yet make good the dazzling promise of his youth.

It is from men that have ceased to grow and have lost their power to accommodate themselves to changing conditions that I derive my conception of the mental attitude of the cockroach. I seem to see the lady cockroaches especially contemptuous of other insects that skite around and let their children grow up just anyhow. "Call themselves mothers!" snorts a matronly *Periplaneta orientalis*, her long antennæ quivering with disgust at such carryings-on. "Pretty mothers they are! All they seem to think they've got to do is to lay eggs by the hundred and then go gallivanting off, trusting to luck that some of them will hatch out. Mothers? Huh! Huz-zies, I call 'em."

The mosquito may launch her silvery boat of forty dozen eggs on the still pool in the early morning and then sing the happy hours away till evening comes and foolish people go out on the front stoop, but the mother of cockroaches remembers what it says in the autograph album about sleeping and dreaming that Life is Beauty and waking up and finding that Life is Duty. She lays only sixteen eggs, and does them up neatly in a nice sort

of valise, with the eggs arranged so that when the little ones are hatched they face each other in two rows, as in the third figure of the lancers. This valise she carries with her and never parts with it until all pip out. There is not one case on record, I believe, where a female cockroach has lost this precious valise in a Monday-morning bargain crush. Many a human mother has forgotten all about her baby in its carriage till she got home. I knew

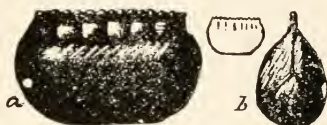


Fig. 25. Egg capsule of *Periplaneta americana*; a, side; b, end view.

of a very comical incident once where the mother left her baby outside the drygoods store and had a perfectly lovely time shopping. When she came out her baby was frozen stiff, dead as a hammer. I have always thought that was a great joke on her.

When Mamma Cockroach feels the little ones stirring inside she helps them rip open the crinkled seam of the valise and teaches them the first lesson of economy by eating up the empty egg-case. This may be thought by some to be incompatible with the high social standing I have claimed for the cockroach. Not so. Nobody can possibly be so sticking mean, so stingy, so hard at a bargain as an aristocrat, that knows that his position is assured. It is the \$15 a week clerk that is anxious people shall not think he is so poor he cannot fling his money right and left. Everybody knows the multimillionaire has money, and so he can afford to live up to his likings and have a piece of apple-pie and a glass of milk for his lunch and smoke a two-for-five cigar afterward. Then, too, he is economical from lack of knowledge. He has no idea of the difference between ten cents and ten thousand dollars. They are both the same

to him, money—money to be got and kept. If you want folks to think you are somebody, always let the other fellow pay the carfare. They say Russell Sage does that. It is to his credit. Shows he has good sense and is not afraid to act up to his convictions. Why should you pay another's carfare any more than his rent? Don't give your old clothes to the Oneida Indian mission. It only degrades the Indians and makes them ridiculous in their own eyes and other people's. Wear 'em out and then make braided rugs of them, since you cannot eat them up as the cockroach does.

Mamma Cockroach impresses the lesson upon the little white buttons that have just emerged from the shell and are looking about them at the bright and beautiful new world. "Waste not, want not," she says with her mouth full of valise. They remember this, and as fast as they get outside their old clothes they get outside them. I do not know that I make this quite clear. Let me try again. They were inside their old clothes a moment ago. They burst them and get outside them. Then they put the old clothes inside them. It's all right now, isn't it?

It used to be thought that it took the young from four to five years to grow up, but that was too extravagant a guess. Observation shows that the Croton bug matures in from four and a half to six months, and specimens of *Periplaneta americana*, the standard American cockroach, hatched on July 11, began to go out in society between March 11 and June 12 of the following year. In the colder climates they retire from active business to winter quarters, where they hibernate.

Almost no other insects ever so much as see their mothers. Some little provision is generally made by laying the eggs in a favorable location or stocking a cell

with food for them, but even among the almost human bees the little ones stay in solitary confinement, each in its cell, tended by elder sisters, but never catching a glimpse of the lady of the house. But Mamma Cockroach broods and protects her little ones. There are few more touchingly domestic scenes than that of a happy cockroach home with all the little ones playing about, climbing over Papa, sitting on Mamma's back, or cuddling under Uncle George or Aunt Eliza. (The names, of course, are fictitious, but the fact can be easily verified.)

That this tender care is not without results is demonstrable by the size of the brood, of which there is only one in the year. If the female cockroach were as giddy

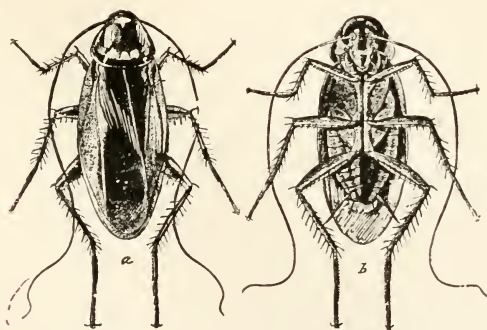


Fig. 26. The American roach; *a*, from above; *b*, from beneath.

and thoughtless as the house-fly she would have to be as prolific. Two million descendants are a good many for one summer, and yet there doesn't seem to be much difference year by year in the number of house-flies. Sixteen is with us considered a fairly good-sized number of children, and one that justifies putting all the boards in the extension dinner-table, but compared with two million it may be said to be a very small family indeed. Ah,

yes, it pays to emulate the example of the cockroach in caring for one's offspring.

Then too, the house-fly, being a comparatively recent comer, has not the wealth of accumulated wisdom behind it that the cockroach has, and so is not nearly so good an insurance risk. In all the millions of years since the coal measures were thoughtfully put in our cellar, the earth, the cockroach has learned how to live. It is smooth and thin, hard to catch and easy to hide. The cockroach never saunters. It always runs, and having three pairs of legs it gets over the ground with considerable agility. Anatomically regarded, its legs are the standard pattern for all the six-legged tribe. The first and third leg on one side and the middle leg on the opposite side are always down together, one to pull, one to push and the other to act as a pivot and support. Its eyes may not amount to much to warn it of the approach of foes, for they are bent under, like its mouth-parts, for convenience in eating, but the long, hundred-jointed filaments of its antennæ are extremely sensitive to jolts and jars. These filaments are pitted all over with little depressions, and the entomologists guess that they are not only feelers, but compound noses. The old Romans called the cockroach *lucifuga*, fleeing the light, but the old Romans did not observe very closely, or they would have seen that it is not the light the insect flees from, but the one that carries it. Flash light on them all you like. They do not object. But take one step, whose tremor is conveyed by walls and floors and sets their antennæ to quivering, and the rustling and scuffling to get under cover show how anxious they are to avoid publicity.

I am going to be scientific now, but only for a brief paragraph. That the cockroach has stuck so closely to

The Aristocrat of the Kitchen. III

its ancient type has been of very great service to the entomologist, for many other insects have found it necessary in their business to modify various parts of their bodies so much that their origin is often completely disguised. Particularly is this the case in the mouth-parts. By comparing the corresponding parts of the cockroach's mouth it is plain that that very complex organ, the *labium*, was once a pair of jaws that became fused together, and from that have been diversified in the most interesting fashion. The cockroach, being of noble lineage, is in a way a sort of standard insect, and by describing its anatomy I practically describe that of all other insects. It has no lungs, but breathes through ten tubes on each side of its body, the little tubes being spirals like those on a door-spring. It pants for breath with its abdomen. The heart is a long, soft, banana-shaped purse of a tube, under the shell on the top side of its body. There are no veins or arteries. The watery blood circulates around loose.

Six-legged or two-legged, the true aristocrat has no desire to mix with the mob. He believes in sticking to his own set. He holds the others off. For, in the struggle for existence, to have too many fond of you is distinctly to lessen your chance of survival. For instance, what is it makes the existence of the vanilla grower one ceaseless vigil? What but the fact that from root tip to flower bud the vanilla plant is popular with all kinds of creatures, with backbones and without them, shelled and unshelled, furred, feathered and fuzzy, winged, walking and crawling? That is why at all hours of the day and night the vanilla grower must be eternally saying, "Shoo, there!"

The cockroach is no vanilla plant. Nothing like it. He has a flavor, though, that defends him as well as if he

bristled with spines. He is not hail-fellow well-met with all sorts of creatures. About the only animal that likes him is the tree-toad, although among some peoples salted cockroaches are a great delicacy. I cannot say if they are really very good. I never tried. I should think not, though, for cockroach tea and cockroach pills are used in Russia as remedies for dropsy. People are not accustomed to make medicines out of goodies.

Cockroaches have the habits of a confirmed tobacco-chewer and expectorate freely in safe run-ways, probably to mark the places for identification. They have glands that secrete what they think is perfume, and it is so lasting that it ruins articles of food, especially coffee, to be left on a shelf where roaches run. Nothing but boiling water and soapsuds can remove the taint.

Because of this, and also because it is a scavenger, the roach is unpopular. The variety called the Croton bug, because of its early recognition of the value of a system of waterworks, by following the pipes of which it could reach the homes of all and attain warmth and moisture almost equaling the long-lost days of the Carboniferous era, the vanished Eden of the cockroach, is really a German importation. Although it does not bear the label "Made in Germany," it is named *Ectobia germanica*, and is much smarter than the others of its race. Yet in North German kitchens it is called a "Suabian," in South Germany a "Prussian," in East Germany it is a "Russian," and in West Germany a "Frenchman." Sometimes it is also a "Spaniard" or a "Dane," but never, never does a countryman of "Wild Willi" admit that *Ectobia germanica* is a German, East, West, North, South, High, Low, or Middle. They wash their hands of the whole tribe, and would like to wash their cupboards of them, too.

The Croton bug is rather the smallest of the roach population of our houses. He is five-eighths of an inch in length at maturity, is light brown, with two dark brown stripes on his thorax. As becomes an inhabitant of this continent of great things, the *Periplaneta americana* is the biggest, though the tropical "drummer," which beats rhythmically on the woodwork with his wings, is two inches long and measures three inches from tip to tip of his outspread wings. It is said that under the equator there is a connection of the family, very gay-colored and fully six inches long.

But although more than one thousand

species have been described, and it is guessed that there are more than five thousand in different parts of the globe, at the "cinther of the wurruld" there are only four, and these are found to be a great plenty, the American roach, *Periplaneta americana*; the Australian roach, *P. australasiae*, which, being a good sailor, fond of a roving life, the warmth and moisture of the forecandle, to say nothing of its picturesque untidiness, is now generally distributed by ocean-borne commerce; *P. orientalis*, the Oriental cockroach, or "black beetle," as our English cousins call it, because it is not a beetle and is not black, but dark brown. Last of all, and least of all, comes our friend the Croton bug, *Ectobia germanica*.

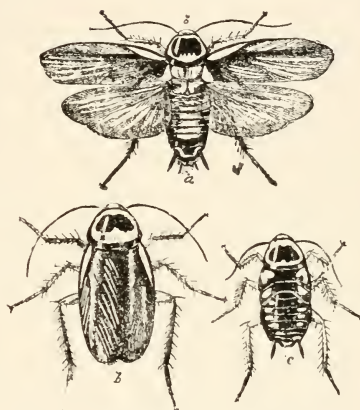


Fig. 27. *Periplaneta australasiae*, the Australian roach; male with outspread wings, female, and pupa.

You will never find these four varieties dwelling together in amity in one house. Like the stanch old Tory that he is, the cockroach is intolerant to the last degree. If he cannot beat his kinsman in the battle to the death he emigrates to another house, where he may hide in a crack of the wall and mess up the woodwork according to the dictates of his own conscience. He is second to none in his advocacy of the strenuous life. Put into a bowl with an opposition roach he furnishes as fine a gladiatorial show as one could ask for, considering the price. The victor does not bother himself with the gate-money. At the conclusion of the entertainment he gathers up the fragments of his adversary and eats them, that nothing be left, thus tidying up the ring for the next event. This manner of keeping the boys home evenings, by making home an interesting place, is said to be very popular among the Chinese.

Being scavengers, cockroaches are omnivorous. They will devour everything but the poisons set out for them. Any dead animal matter, cereals, woollens, shoes, cloth and leather bindings—all are acceptable. But what they chiefly dote upon is flour-paste. "Oh!" exclaims the blattidean epicure, throwing up both antennæ in an ecstasy of appreciation, "when I am dead, remember me by flour-paste!" It is this that makes them such a trial to librarians. The United States Treasury Department had to have a whole set of reports entirely rebound on account of them. Even the lettering had been nibbled away, not because the cockroach is such an enthusiastic gold-bug that it eats the metal, but the albumin that sticks it on is extremely grateful to its palate. In Lapland they frequently bring on real destitution by devouring and tainting the dried fish stored up for winter use. Brazilian mothers, justly proud of the long and curving

eyelashes of their children, are often made to grieve at the sight of those lovely lashes nibbled over night by roaches in the most distressingly mangy-looking manner. It is said the Brazilian housekeepers encourage spiders which destroy the roaches. Maybe so, but I think it is just an excuse for not getting rid of the spiders. Finger-nails and toe-nails are also considered delicate eating by roaches, which have strong biting jaws, even if they do work sidewise instead of up and down.

Having no particular objection to anything they can get their jaws into, there is one service of which they are capable. But first let me tell a little story. Once there was a little English boy born to a family of the name of Bugg. His sponsors in baptism gave him the Christian name of Bedford. What they could have been thinking of the dear above only knows, for I can't imagine. When Bedford Bugg grew up to be a man he found his collocation of names a burden too grievous to be borne, so he petitioned Parliament to let him change his surname to Norfolk-Howard, which was done; thus outfitting my gentleman with three of the most aristocratic appellations in the United Kingdom, and at the same time supplying lodging-house keepers with a most genteel word to be used thus, "And, sir, you will find no Norfolk-Howards in my beds." Well, then, the one service of which the cockroach is capable to usward is that it will destroy Norfolk-Howards mercilessly, pursuing the shrieking creatures into the farthest recesses and slaying them without regard to age or sex. It is a great service, but, like that of the red ant, considering that it means the permanent establishment of the cockroach in the house, the price is cruel high. Better stick to sulphur.

For, once the cockroach has decided that he likes the

place and makes up his mind to stay, it is no easy thing to exterminate him. They have as many ways of getting in as the Norfolk-Howards, and the builder has had them in view from the start, for when he began to build he walked the floor and walked the floor, asking himself the question, "How can I arrange it so that there will be the maximum number of pieces of wood in the trim under which roaches may find a home?" Also it must never be forgotten that the battle is not with some poor-spirited thing just starting out in life and easily discouraged, but with a foe backed by countless ages of inherited experience. I would not for the world utter one word of carping criticism against cockroach poisons. I believe them to be all they are represented to be in the advertisements, and even more. I believe that if all the roaches could be persuaded to taste a little, just to see what it was like, without doubt they would perish everlastingly. But that's just it. They won't. Fond as they are of flour-paste, put but one tiny smidgen of arsenic in that paste and no roach will come near it. That is how the rebound volumes of the Treasury Department have been preserved from the slightest subsequent depredations. Also, there have been many cases where human beings have been fatally poisoned by what was meant for cockroaches. One case I remember in particular where the poison was taken for Rochelle salts, which it resembles in no other way than the sound of its name.

It is said, though, that chocolate and borax in equal parts, mixed and powdered finely in a mortar, while harmless to man, will kill the pests. They are extremely fond of chocolate, and their passion for it makes them take the borax, which is highly deleterious to their systems.

The ingenuity of man from the earliest ages has been directed to the construction of cockroach traps. Getting a roach into a place where there is something to eat is easy enough; getting him to stay there till you can come and kill him is another matter. Putting molasses on a piece of board afloat in a broad basin is said to be a great success. I doubt it, for it is my experience that a cockroach is hard to drown. He does not throw up his six hands at once and sink bubbling to the bottom. I suppose eventually he does drown, but I have never had the patience to wait and see. I have found that the least little kerosene on the water has the effect of instantly killing him.

Another trap is a glazed bowl half full of stale beer or ale—their pledge allows them to drink malt liquors—with a lot of sticks leaned up against it and projecting over the liquid. They drop in and drown themselves and, presumably, their sorrows, in the flowing bowl. There are other traps, all depending on the fact that the roach cannot climb up glazed surfaces, boxes with glass rings around a hole in the top, and the like. But the trap is a niggling kind of warfare at best. It lacks breadth of scope and action. There is nothing whole-souled and generous about it. Then, too, it defeats its own ends in the long run, for the wise cockroaches that shake their heads and say, "Well, I don't know about that; guess I'll be just as well off if I keep away," are preserved, and the heedless exterminated, so that the race tends to become warier and warier, and we bequeath to posterity yet unborn a household pest that no trap can allure, be it ever so tempting. The cockroach of to-day is plenty smart enough.

Destructive agencies that fall alike upon the wise and the unwise are quicklime and Persian powder, blown into

the cracks where they hide. It is a mistake to suppose that the Persian powder will kill. It is suffocating, for it gets into the little holes in their sides through which they breathe. They stay in hiding after the powder is blown in on them as long as they can and then they rush forth nervously, apparently crying, "Mercy land! I can't stand this!" Well-directed blows with a felt slipper at such times do great execution. I often wonder that housewives do not appeal to the Anglo-Saxon passion for the chase in husbands and sons. There is much sport in a cockroach battue. Under the water pipes by the range, and in the crevices of the stationary tubs, are famous hunting grounds. If you have a taste for scientific experiments, you may seal up the door and windows with strips of paper smeared with molasses, and then sprinkle bisulphide of carbon about. It is a volatile liquid, whose vapor is destructive to all small life. It permeates the house with a vociferous fragrance, compared with which frying sauerkraut is a mere whisper. It is similar in character, though not so permanent, as the perfume of the little animal with black-and-white stripes around its tail, which is not a vanilla plant, either.

If all this does not deter you, I feel it my duty to give the further warning that if the vapor of bisulphide of carbon comes in contact with flame it goes bang! regardless of consequences. It is very impulsive, like gasoline.

The fumes of burning sulphur are just as efficacious as bisulphide of carbon, and not explosive at all, but they blacken gilt things and impart a distinct flavor of blue-tipped matches to all and sundry contents of the room. Skippers of fishing smacks, not afraid of being thought finicky and over-nice, use the sulphur process a few days before beginning the season, and follow it up two weeks

later to kill such roaches and Norfolk-Howards as may have hatched out since.

The Mexican remedy I particularly desire to bring to the attention of those who recognize the power of the mind over material ills. It is the simplest of all. Catch three cockroaches and put them into a bottle. Take the bottle to a cross-roads. Turn it upside down, and while the roaches are dropping out, repeat three *Credos* aloud. All the cockroaches in the house from which these three were taken will instantly pack their things and go, so it is said.

I don't believe it.



CHAPTER

VII.

FOES OF CLOTHES AND CARPETS.

ON the first chilly evening of the fall in any public place where many people assemble, all diked out in their best, my old friend patchouli for once meets a rival odor that is more than his match. It is the clinging perfume of moth-balls. While not exactly the smoke of battle, it is nevertheless the evidence of a warfare conducted strictly on Chinese principles against an enemy that attacks the very citadel of civilization itself, clothes. Now, concerning the white and glistening naphthalin of which these moth-balls are made there is quite a long story to tell, when it all comes out, which may not be for many a long day yet, seeing that the coal-tar products are a regular magician's bag. Anything you may want in the drug line is probably there. Naphthalin was once the second greatest discouragement a gas company had to contend with. It has been done away with by discontinuing the process of making coal-gas out of coal. But the greatest discouragement of all will probably never be done away with while human nature remains as it is. I mean the mental anguish inflicted upon all connected with the

business by consumers complaining that the price per thousand cubic feet is extortionately high, that the gas is miserably poor, and that they are charged with more than they ever burned. You can always tell the president of a gas company by his worried, anxious look. He is often rich, it is true, but he has to be in order to bear up under the burden of his existence. Some may envy those who have amassed great wealth in this department of industry. I do not. No, sir. If Fate were to say to me, "Take this large bunch of money. It is made in the gas business," I should look her way for politeness' sake, but I should not grab rudely.

"Take it," says she to me, we will suppose. "But hold. Stay your hand. With it you must take the consciousness that every householder's teeth are gritted at you at least once a month. Take it, but for every dollar that I give you, must be repeated on every business day the bold and unsupported statement that the inspector really does inspect the meter and does not make up the figures out of his own head. Take it, but for every dollar on every business day must you listen to the vehement declaration that the bill for last month cannot honestly be so large as that for the month before, because all the members of the family but papa were away in the country, and papa went to bed every night in the dark because he did not want to heat the house up, and besides he didn't know where the matches were kept. You must say something to these complainants that will let them know that you know that what they are saying is not so, and that without making them think that you said they were lying. Do your best, and still in every bosom will remain the firm belief that you rob, and that without recourse. It will avail you none to know that all these accusations are wicked, lying slanders; that after you settle

with the legislature and the common council there is only a bare living in it for you; that if people do not want to buy gas of you there is no compulsion on them—they can sit in the dark; that you do your very best to make the bills about what you think they ought to be, and that a year ago last October a man let his bill run up 'way beyond his deposit and never paid you the difference—it will avail you nothing. They will still believe you a robber. Here is the money. Will you take it?"

No need for Fate to add, "Ponder well." I have already done all the pondering necessary. No! No! a thousand times, No! Rather will I choose poverty and the glad, free life of him that uses kerosene and notes the ring the cheerful evening lamp has made upon the nice clean tablecloth than such riches. 'Better to slop my clothes up with the first pourings of a full five-gallon can than to be harried into my grave before my time by unjust suspicion that I raised the gas-bill from my greed for gold.

This is the greatest drawback to the gas business, and it can never be overcome so long as the cowardly practice prevails of sending the women-folks to the gas-office to complain. Almost any gauzy romance will satisfy the men, but it is heart-breaking to give a beautiful explanation and at the end of it to hear the woman say: "Well, I think it's very funny. Why, we were all in the country, *all* of us but papa, and *he* went to bed in the dark every night because he couldn't find the matches. I think it's *very funny!*"

The naphthalin drawback was considerable while it lasted, for when coal was distilled this product crusted on the inside of the mains and could hardly be got off with hammer and cold chisel. In the mains, mind you, and though the meters went grinding on the same as

ever, still it was a patent fact that no gas to speak of got into them. The gas people ran rotary brushes through the pipe and hitched team after team to the rope, and many a telegraph pole to which block and tackle had been fastened did they pull up by the roots. There isn't any of this stuff left in the mains now, for the water-gas is eagerly looking for something of the kind with which to enrich its flame, and is blue for the lack of it. Naphthalin would help the gaslight out greatly, but of all the many properties this chemical possesses the one that concerns us most now is that it has such a bad smell that it is supposed to spoil the moth's appetite for our winter clothing. To this tiny fluttering thing, scarce half an inch from tip to tip of its extended grayish-yellow wings, indistinctly tawny-spotted, we begrudge the little bite it eats and, though women are most merciful, among them there is not one to play the part of Uncle Toby and to declare that there is room enough in the world for both her and the moth, especially if she have just opened out her best pair of blankets and noted the ragged holes gnawed in them, or stripped the mangy hair off by handfuls from her "real" sables.

We say, "The moth has eaten them," but moths never eat anything. What a nice tender bit of blanket tastes like, or a sirloin cut out of an evening coat, they haven't an idea, unless their memory lasts over the great change that takes place when they cease to be ever-hungry children and become adults and proper subjects for the grand passion. Not even can they flit from flower to flower and sip the fragrant nectar. The reason is very brief: They have no mouths. The story of how this came to be is very long, ages long. Evidently from the fact that there are still rudiments of the mouth, once on a time the grown-up *Tinea pellionella* did eat,

but that was long and long ago, and clothes-moths' jaws have dwindled from mere lack of exercise. They kind of got out of the way of eating, perhaps

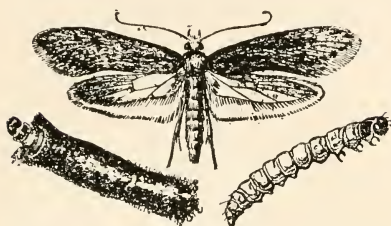


Fig. 28. *Tinea pellionella*, the common clothes-moth; adult moth, larva, and larva in its case.

because it took their minds off what is after all the most interesting thing in life—falling in love.

I am about to enounce a great discovery that I have made all by myself.

So to speak, I have picked it right off my own vines. I am led to it by analogy, which, I may say here, is the most accommodat-ing thing yet invented by man when he wishes to make positive statements upon a subject of which he knows nothing whatever. You can prove anything by analogy if it isn't carried too far. The great thing is to know where "too far" is, which is generally where the analogy begins to disprove what it has just proved. It is one of the crowning glories of the New Psychology that certain human traits and abnormalities have been properly referred, not merely to the apes and monkeys, but further back—oh, much further back—than that. Say, to fishes. Perhaps you have wondered why it is that we are so fond of swimming, when it is an exercise very distasteful to monkeys, and presumably to our simian ancestors. All vertebrate life starts with fishes, and this hankering to go swimming, noticeable in boys, who are eminently conservative of habits of mind,—instincts, if you will,—is simply a harking back to our ancientest mode of life. Each individual of us passes through in his own history all the mutations that the

race has gone through, and at one stage it is apparently a toss-up whether the human embryo will be a fish or a man. Some persons, though they acquire lungs as they progress, neglect to close up the gill-openings under their jaw-bones. But the clincher is that women, who resemble boys in conservatism, are far more addicted than men to suicide by drowning. Thus it is that the influence of ancestors that swam the dim Devonian seas persists unto this day.

Now, just to show you what I mean by carrying the analogy too far, let me ask you if you have ever tried to teach a conservative woman how to swim? If so, you will bear me out that the influence of our scaly ancestors that swam the dim Devonian seas has petered out a good long while ago. I once endeavored to demonstrate to my wife that the water would bear her up if she would only let it, and the upshot of all was that she went up on the beach and cried because I had undoubtedly tried to drown her, an act of which she had hitherto believed me incapable. I give you my word, ladies and gentlemen, the water was not two feet deep and drowning her was the furthest from my thoughts. I do hope somebody will believe me; my wife won't.

Boys are conservatives, too; but whereas a fish prefers cold water, where is the boy that will go in all over in the winter? It is as much as you can do to get him to wash his fingers up to the knuckles and a little island about his mouth.

If you want a really fine instance of "too far" in analogy, why, it is as easy to show that man was originally two animals sewed together. If occasional gill-clefts prove a fishy origin, does not the far more frequent hare-lip point to the two halves sewed together with some of the stitches ripped out?

The New Psychologists probably feel that they knocked the bull off the bridge when they traced our descent to the fishes, but I am not devoid of a certain amount of bull-knocking ability myself. Have you ever noticed that when a young couple get taken down with an acute attack of the real, old-fashioned lovesickness—I don't mean a mild form of the modern varioloid, but the genuine puppy-love where it strikes in and breaks out again in a rash of poetry, and the patient is slightly delirious, and keeps asking, "Who do you love? Huh? Whose lovey-dovey is oo?" Did you ever notice, I say, how inhibitory this affection is of the normal appetite. Why, the two of them don't eat as much as would feed a bird. And even when the symptoms are less pronounced neither of them dares to do more than pick a trifle in the presence of the other, so that for appearance' sake they are obliged to fill up at home with something substantial, so as to seem to the Adored One each to be a delicate feeder? One of our standard jokes is about the young man that takes his beloved to the restaurant, where she eats him poor. By that joke we are instructed that the Eating Girl, when in love, is a ridiculous monstrosity, and not at all the proper person for a respectable young man to marry. I submit that the analogy between the human male and female in the period of courtship when little is eaten, and the male and female clothes-moth in the same period when nothing at all is eaten, establishes with almost mathematical certainty that the human race is descended from the Tineid branch of the Lepidoptera, or mealy-winged insects.

Watch a growing boy at the table, and ask yourself seriously if his behavior is not to be accounted for by the persistence of that instinct that in former ages warned him that he had better eat while he had a chance.

One cannot but envy these little insects their happy estate. Alas! too often with us the smoke of the kitchen dims the flame of pure affection, and the gross, carnal exercise of feeding snaps the frail thread that binds two hearts together. When Edwin sues for Angelina's hand the questions that her father asks are not, "Does this man truly love my daughter? Does she love him with all the fervor of a true attachment?" but, "How is he fixed? Can he maintain her in the comfort to which she is accustomed; that is to say, her three square meals a day and a cold bite before she goes to bed?" Ah, my friends, such thoughts as these, how oft they chill the ardor of the tender passion in our bosoms! And not only are the present needs of Edwin and of Angelina to be thought of, but the needs of those that are to come, the olive-branches round about their table. As I once heard a celebrated pulpit orator say: "A man may brave the future for himself, and his young wife may fear not to cast in her lot with his, but what when there are seven little mouths to be fed and seven little backs to be clothed and seven little feet to be shod?" What indeed?

I don't suppose the clothes-moths pick and choose much in their mating. Creatures that cannot eat dare not deliberate too long over choosing partners for life when that life is so very brief. It is one fond embrace and then farewell forever!

Entomologists do not know exactly how many the moths have in a family. There may be one hundred or there may be six hundred eggs laid, but they are not laid in one bunch, and are not easily seen. The clutch is large enough, at any rate, not to worry the poor mother, as she breathes her last, with fears that after her there will be no more moths. If she cannot get into the box

where the winter things are stored, she can at least lay her eggs near a crevice, confident that her children will know enough, as soon as they come out of the tiny eggs, to creep through the crevice to where wool awaits them.

Though mamma may have no mouth, each of her children has, depend upon it. Angelina of the next generation is a tiny thing, dull white in complexion, except where her head and the next joint (you can hardly call it her neck) protrude from her frock. These are of a delicate nut-brown. It is not all modesty that makes her clothe herself so completely. The tube, made out of what she feeds upon, is at once a protection from injury and a place of shelter. She is a luxurious creature, and wears silken underwear of her own spinning. All the Tineids are just so, even those that roll up apple-tree leaves to live in. When she has gnawed all the goods within reach, she wanders on a little farther, and apparently bites holes in the fabric as much for the fun of it as to satisfy her appetite. As she grows and her frock begins to feel tight, she cuts a slit in it and lets in a gusset or triangular gore of new material. A similar insertion is made in the opposite side, and then she reverses herself head for tail and makes corresponding alterations in the other end. Lengthening is effected by adding to either end. By transferring her from time to time to different colored stuffs the experimenter may give her as variegated a frock as he wishes, and one that illustrates her ideas of dressmaking.

The importance of having a mouth that is soon to disappear is insistent, and if the housewife finds the carpet under the piano, where the servant's broom went all too seldom, piebald where the backing shows through, let her console herself, if she can, with the thought that it is lucky for her that her tiny foe has no such appetite as the

young of the *Cecropia* moth. They are big things and have to eat four or five times their weight daily, so that when they mature they may attain the breadth of a hand-span from tip to tip of their outspread wings. They have need to hurry, for their lives are only two weeks from egg to egg, but the clothes-moth's grub may take her time. She has a year before her; she is scarcely the thickness of the lead of a lead-pencil, and her food is not succulent green stuff, but as substantial and condensed as hardtack. Still she manages to devour quite as much as is satisfactory.

There comes a time when she must leave her happy home in the box of winter things and go out into the great, wide world. When she can, she forsakes the old place, but never her modest, maidenly ways. She takes her frock with her, sometimes even climbing a fifteen-foot wall to attach herself to a quiet nook of the cornice. There she falls into a stupor that gives another proof of our descent from clothes-moths. It is the period of her life that corresponds to the awkward age in those that were children yesterday and will be young ladies and gentlemen next week. Their senses leave them only enough to make them unreasonable and hard to get along with, but our ancestral relations, the Tineids, manage it better. Their hobble-de-hoys, boys and girls, go sound asleep for three weeks, and then wake up, full-grown and with all the sense they ever will have. In such a long nap one must turn over from time to time, and every movement wriggles the chrysalis in the larval case, so that, when the time comes, it is no trick at all for the young mouth to creep forth, shake the wrinkles out of her pretty pale wings, and go in search of an eligible *parti*, just as her mother did before her.

A cousin of hers, *Tincola bisellicella*, the webbing clothes-

moth of the Southern States, has two broods a year. Its larva constructs no case or frock for itself, but spins a silk-embowered path for itself wherever it goes. It is of

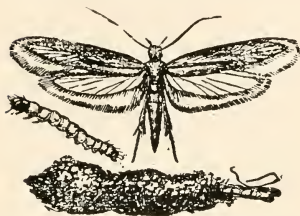


Fig. 20. *Tinea biselliella*, the webbing, or Southern clothes-moth; adult moth, larva cocoon, and empty pupa-skin,

an uniform ocher tint, and it has been reared in England successfully on a dainty diet of cobwebs. Its particular joy is to find out where there is a collection of the most expensive insects, and then to devour them utterly, thus satisfying its cannibalistic appetite.

It is evident that, when all the living creatures passed before Adam to see what names he would give them, the young of these moths could not have been clothes-eaters, for the very simple reason that there were no clothes to eat. Our first parents had not even got as far as the fig-leaf costume.

What did the clothes-moth originally do for a living? In the world every employment is greatly overcrowded, and a man has to turn his hand to what he can. When an animal dies, it is easy for Dame Nature to get rid of the flesh. There are no end of creatures only too glad to get the contract to take it away, even if the bacteria and carrion-flies were left out of the calculation. But the fur and the feathers, how about them? Dame Nature one day hung out a sign:

HELP WANTED.
EXPERIENCED INSECT TO REMOVE FUR.

The original clothes-moth undertook the task. When man appeared on the scene, *Tinea pellionella* found the

garbage heap outside his dwelling quite a Klondike, so mighty a hunter was he. It was, perhaps, an error to get into furs which had not been thrown away, as *Tinca* supposed, but merely discarded for the summer; but how was the moth to know that it wasn't in the contract? As man progressed and found out how to weave cloth out of wool, *Tinca* kept pace with him, and now has as fine a taste in woolen stuffs as he.

That this moth has been long in the business is evident from the fact that the adult has no mouth. Also it is so

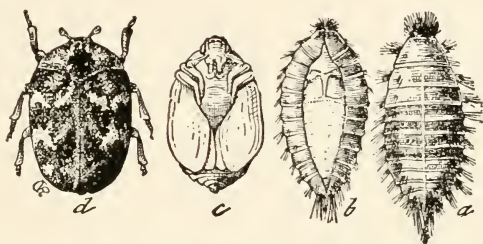


Fig. 30. Carpet beetle, or "Buffalo moth"; a, larva; b, pupa; c, pupa, ventral view; d, adult.

set in its ways that though houses are nowadays equably warmed by steam in winter, it still takes a vacation then, and only begins work with warm weather. Not so with the so-called "buffalo moth." In warm houses it works all the year round. Carpets are its specialty, and it finds that the Northern States afford a fine field for its activities. They haven't got as far as polished floors in many of those States, and it gnaws along the cracks to its heart's content and the housewife's discontent. If it ruins other people's goods with impunity, it has as fine a sense of economy as the cockroach. It molts frequently, and thriftily eats up its own cast-off skin. It is not a pretty beast at all. Its larva is about half an

inch long, with tufts of dark brown hair sticking out over it. It somehow looks like a buffalo, though it is not a moth, but a beetle, with its black, hard wing-case covered with tiny scales that give it a marbled look. Disturb it, and it tries to convey the impression that the nervous shock has been too much for its weak heart. It dies, right then and there. But it is only "possunning." By and by, when it thinks you are not looking, off it flies into the garden, where it shows its respectable origin by sucking the honey from the spiræa, milfoil, and the different kinds of snapdragons. It, too, has a cousin in the business, whose larva has an ugly plume of black hairs on its tail. It eats carpets, too, but rather prefers featherbeds and pillows, whose contents it most neatly felts.

Do not think that because these gentry are, comparatively speaking, new to the trade they are easily to be discouraged. Far from it. The carpets must be taken up, thoroughly beaten, sprayed out-of-doors with benzine, and allowed to air for several hours. The rooms infested must be carefully cleaned, scalded with boiling water, and the cracks flooded with kerosene or benzine.

If the cracks in the floor are pretty wide, better fill them up with liquid plaster-of-paris. If the buffalo still persists, lay a damp cloth smoothly over the carpet and iron it with a hot iron. The steam kills the insects immediately beneath.

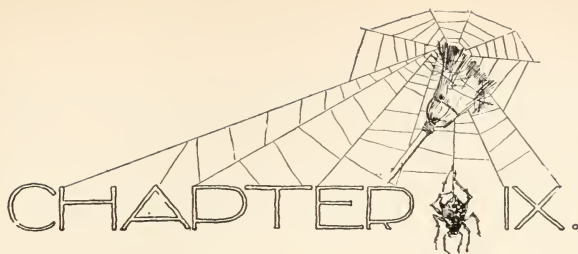
In the fight with the clothes-moth the greatest chance of defeat is in trusting to the new-fangled wisdom that relies on cedar chests, camphor, tobacco, moth-balls, and chemists' devices. Noah's wife probably practiced the policy of shaking, brushing, beating, and exposure to the sunlight and air, and in all these years it has not been improved upon much. (That is, after she got out of the ark. If she was any kind of a housekeeper she must

have given up all hope of trying to make the place look like anything with all those animals tracking up the floor.) Only so long as the disagreeable odor is in its prime freshness will the moth refrain from laying her eggs in the clothes so protected. But if the moth is shut up with the clothing and cannot get out, she will lay her eggs anyway, and they will hatch out, and the worms will fret the garments, and the garments will fret the housekeeper that put her trust in camphor. Dr. Howard, the entomologist of the United States Department of Agriculture, and a man that knows what he is talking about, says that the best way is to beat, brush, and sun the articles to be stored, put them into those large paste-board boxes that tailors use to send home clothes in, and gum a strip of wrapping-paper around the edge so as to seal all up completely. The moth cannot get in to lay her eggs, and the wearer of the garments will not be plagued with the smell of the preservatives which is scarcely less an annoyance to him than to the moth.

Quite a rainbow of promise was spread in the sky of hope by the entomologist Balbiani. There is a sort of fungus called muscardine, that kills off the silkworm. He powdered this up and sprinkled it over clothes infested by moths. The grubs ate it and died. But you know that if you were to cultivate burdock and your whole living depended upon a good crop the plants, otherwise indestructible, they would die if you so much as looked at them. So, this muscardine, which is a perfect pest to the silk-worm breeder, loses its strength if kept any time. The rainbow of promise that looked so beautiful in the sky of hope has faded. There is no royal road to freedom from moths, and to the end of time we shall probably have to beat and comb and sun our furs as in the days of Noë.

By the way, before I forget it, carriage linings are furiously attacked by moths. It is well to spray them with benzine in April, June, and August. Another plan is to sponge the linings carefully with corrosive sublimate dissolved in alcohol. Don't get it too strong, or it will leave a white stain. And whatever you do, don't taste it, for it is deadly poison. Indeed, it should be well remembered that war, though against insects, is still war, and waged with deadly weapons that do not discriminate between friend and foe.

These that I have mentioned are domestic remedies. In the large cities where there are cold storage warehouses, protection can be guaranteed. The most economical degree of cold has been found to be 40° Fahrenheit. That does not kill the grubs, which can stand it as low as 18° without being much the worse for it so long as it is steady cold. But if they are kept at 18° a while and then shifted back and forth to 40° , the change in the weather is bad for their health.



CHAPTER IX.

SPIDERS.

As one walks forth from his house on a calm spring morning, when every grass-blade is gemmed with dew; when the scented air is all embroidered, as it were, with shining strands of melody from the song-birds hidden in the fresh green leaves; when the cattle crop the tender grass and the hens cluck cheerily as they scratch in the moist roadway dust; when all around the sky is rimmed with cock-crow answering to cock-crow, one stops a moment and exclaims, "How calm and peaceful is the scene!" Something stirs within the breast, something that calls to higher, better things, something that asks us why we cannot always be kind and gentle and forbearing, honest and just in all our dealings. A genial warmth o'erspreads the soul and we resolve—— And just then we jam our hats down tight over our eyes and run like the Indians were after us, for we hear our train coming, and we were late to the office yesterday morning.

It is a good lesson, though, to take and keep, but Nature is a poor instructor in kindness, gentleness, forbearance, honesty, and justice. Don't let anybody humbug you with the notion that she is. Man is the prime discoverer of these virtues, and their only known exemplar in the universe. Perhaps he does not exemplify them to any alarming extent just now, but you must remember he has not been at it very long, comparatively

speaking. You drop in some day—say about twenty thousand years from now—and you will be surprised at the progress he has made.

The fact of the matter is that Nature is all business. Her advice to everybody is, "Get there," and if she has time to spare, she may add, "It doesn't make any difference how, so long as you get there." All this peaceful scene that we admire so mornings when it doesn't rain, and we have plenty of time to get to the station, is one grand riot of murder and lust. The reason why we think murder and lust are horrible is because we are trying to quit being beasts and are trying to become gods. It is a terribly discouraging undertaking, and sometimes we get out of all conceit with our kind when we see how other people behave, but, all things considered, I think we do pretty well. I suppose that as fair a sample as any in the world of "get there" is the spider. It has even received a favorable notice in the Bible, which is as much as any enterprising person could expect to attain to; though, as usual, the extreme flexibility of "the original Hebrew" is such that the word "spider" may as well as not be interpreted "lizard," in the text: "The spider taketh hold with her hands and is in kings' palaces."

Being so remarkable a creature it is hardly fair to leave it out of this book, though it is not an insect at all, not being cut (*sect*) in (*in*) at the waist. The spider is, strictly speaking, about halfway between bugs and lobsters. It has eight legs instead of the insect's six. It shows no sign of ever having had wings. It has stick-ing-plaster feet like the fly. It breathes through slits in its body, but the arrangement for aërating the blood is different from that in insects. It is a contrivance something between the gills of a fish and the lungs of a man, and yet not like either. The heart, when it beats,

squeezes air in and out through plates of tissue set like the leaves of a book.

There are very many kinds of spiders besides those that annoy the housewife with their webs stuck up in the corners of the rooms and in the windows, when she has been too busy with the sewing to look after the house much; but every kind is an appetite on eight legs, and thoroughly convinced that nobody can be strong and hearty that lives on vegetables. They all spin more or less, whence their name, which is a contraction of spinder or spinner. Also, they bite, and if you listen to all the fool stories that are told, when a spider bites you, you will save time by sending for the lawyer to make your will, and telegraph for the boys to come home at once if they want to see you alive. But I will tell you, as between educated people that know a thing or two and do not get scared over every little trifle, that a spider's bite is no worse than a mosquito's—not so bad, in fact. A big spider can kill a small bird with its poison, but it only makes a man's arm swell up and hurt for a day or less, and not hurt very much at that. That is, the spiders around these parts. In New Zealand they have a little spider that kills you dead if it bites you. How lucky for us the dangerous beasts all live in foreign parts! Bertkau could not feel the ordinary domestic spider on the thick skin of his hand, and only between the fingers could the spider make a puncture like that of a dull pin. The worst result was that it itched a little. Blackwall had them draw blood, but that was all. Though one spider bit another so hard that its liver ran out, it lived for more than a year afterward. As for these terrible tarantulas, either the stories told about victims having to dance till they fell down in exhaustion in order to escape death and madness were tremendous whoppers, or tarantulas don't

bite as bad as they used to. It is true that in those days the Italian violinists had to work overtime composing tarantelles to play for the bitten, but still there were sneering skeptics even then that said it was all a scheme got up to pass the hat for the wife and family of the suffering man, whom a malignant spider had bitten while he was out looking for a job. Dufour had a tarantula that was quite tame and gentle. She took flies from his fingers like a dear thing. Almost any spider can be taught to take food from forceps and water from a camel's-hair brush. They are great water-drinkers, spiders are. I'll say that for 'em. Like the little temperance bird we used to read about, "Water, cold water, is all of their song." Rum and tobacco they turn from with loathing.

I used to think these granddaddy long-legs were spiders; old men, some call them, or harvesters. They are very useful when you want to know the way home. Catch one and—I forget whether you pull one of his legs off or not; I seem to remember that we pulled one off—and then hold him down by one leg while you ask him quite sharply which is the way home. He will wave a foreleg in the proper direction. It is wonderful the intelligence displayed by the lower orders of creation. But the granddaddy long-legs is not a spider. Neither is he a scorpion. But he is somewhere in that neighborhood.

All spiders spin, but not all of them spin snares, those orbed and radiated webs that we see pictured so many times and every time pictured wrong. But that only goes to show that the lower animals are not the only ones that possess instinct. I think it will be generally agreed that artists may be classed among the higher animals. At any rate, their instinct is to draw a thing not as it is, but as it appears to a man that doesn't know very

much about anything in particular. So he lays off his picture of a spider's web with a pair of dividers, and people marvel at the spider's mathematical sense, whereas a spider doesn't bother her head with any such foolishness. She puts her lines where she thinks they will do the most good, regardless of their distance apart.

Here of late, though, I think I have noticed a little improvement in artists. They have begun to notice that the spider always stands head downward in her web, if it be a perpendicular one, and if it is horizontal hangs back downward. Some of these flat-web spiders can hardly walk right side up. But the spider of art never has more than six legs, while the real spider has eight, and the spider of art often has three sections of the body while the real spider never has more than two. The head and chest are in one department, so to speak. There are their eyes, from four to eight in number and disposed in different patterns according to their political affiliations; their jaws, which work sidewise instead of up and down, their poison-bag and a few other arrangements, and in the abdomen or silk department are the heart (a banana-shaped affair), the liver, the slit and tubes that do duty for lungs, and the spinnerets. These last are warty-looking affairs that may be spread apart and brought together exactly like the thumb and fingers of the hand. Each wart is covered with hundreds of little hollow hairs through which is expressed a gummy liquid that turns to silk when it dries. Mrs. Spider slaps her spinnerets broad against the wall and sticks fast I don't know how many hundreds of fine filaments. Then she pulls away the spinnerets and shuts them up, and all those fine filaments melt into one rope, in thickness about one-five-thousandth of an inch. Insects' silk is a simple thread; spiders' is compound.

I am not going into a complex description of how the spider lays off her web except to say that, when it extends across any considerable distance, she has stood on her head as nearly as she could and emitted a thread which the wind blew till it caught on something. Then she took in the slack and bit it off and threw it away. After the line was taut she crept out on it, always keeping in touch with the home-plate, till she got to the further end, which she made good and secure. Then back to the middle again, where she dropped on the end of her line to the ground and made fast there. After that she worked according to the way her people have done since the days when the wood was growing that we now call coal. If it be an orbed snare, then all the outer crossbars are gummed with beads of tanglefoot for careless flies. There is a comparatively open space around the center so that the scuffle that always takes place when there is fresh meat for supper may not wreck the web too vitally, and right in the center itself is usually a nice neat little mat for her to sit on, made of dry, unsticky silk and woven like a crazy quilt or one of these hit-or-miss stained-glass windows. Sometimes, instead of plain radii, she cards her silk into a flock-like ribbon and zig-zags it down one compartment of the web. Some spiders make an all-round snare; some make a snare like a pie with a piece cut out, and one kind makes a snare shaped like the piece of pie that has been cut out. This last sits there with the slack of her web drawn up tight between her feet and waits. A fool fly bumps into the line. She lets everything go by the run, and the sticky slack falls over the fly. She spreads her spinnerets and drops a flat ribbon of threads over it. The more it kicks, the more it tangles itself. When she can safely do so, the spider bites her prey till it gives up. Then she sucks the

juice out of it and sits chewing on her torn silk till she gets all the gum off it, when she throws it away and begins to repair the web.

Other spiders set their webs flat-wise over hollows on the ground, a favorite location being near a path. All the flying and jumping things get out of the way when a man comes along, and not looking where they leap, they make business good. Of course, the man often spoils the web, but, la! that doesn't worry the spider any. There's plenty more where that came from, and, anyhow, she has to spin to pass away the time. By the way, most of their spinning is done at night. In the daytime they take little naps when there is nothing doing. Of these flat-webs some are spun in bushes with a labyrinth of threads running up two or three feet among the twigs over a sort of umbrella-like disk under which the spiders wait. Other little spiders are often permitted to make use of this labyrinth for their own needs, or perhaps it is too much trouble to stop the poaching. There is a good deal of that kind of broad-minded charity in the world.

A little bit like this dome-shaped snare in the bush is the silken diving bell that the water spiders make on the stems of aquatic plants. There is an opening below, and whenever it begins to get a little stuffy in the nest, which is about half as big as an acorn, mamma goes up to the surface and brings down an armful of air. It often takes fourteen or fifteen trips, but she does not seem to mind the bother. I suppose the spiders that live under boards and stones must often say to themselves: "Mercy! what a way to live," but I can assure them that it is quite dry and cozy, and not at all malarious, and then, too, think what a comfort it must be not to have to lie awake nights and listen to those plagued crickets chirp, chirp.

There's everything in living in a quiet neighborhood.

All spiders are pretty good navigators, and when thrown into the water can skate ashore in no time. They never get their feet wet, because the hairy claws imprison the air and keep them dry.



Fig. 31. Lake-navigating spider, with its sails set.

If they are thrown out too far to row in they get to land in a way that puzzled the investigators a long time. The spider stopped running, braced its legs, and seemed to be borne along by some mysterious force. But instead of reporting the case to the Society for Psychical Research, the investigators used their

eyes, and finally one of them noticed that the spider was trying to stand on its head. After that it was easy. She was just casting off a long strand of silk, and the wind was taking it for a sail. When the thread got close enough to land to tangle on a bush or clump of grass, the spider climbed out of the water on it. And then the investigators all said, "Why, sure! Why didn't we think of that before?" That is the way the young ones travel when they leave home their fortunes for to seek. They say, "Well, good-by, ma!" and then climb up on a fence-paling. While she is telling them to be good and to be careful about wasps, and to do up their laundry every week and be sure and write, they are spinning out a thread, and when it gets two or three yards long, away

they go till they find some place where they think they would like to settle down and build up a practice. It is these threads of young adventurers that you feel across your face late in the summer. When Mr. Darwin was on board the *Beagle* sixty miles from land, near the mouth of the La Plata, the ship's rigging was covered with them. He never saw a spider come to the deck on a mass of web, which some people suppose they fly on, but always at the end of one thread.

It is a curious fact that these floating threads will take the bluing off a gun barrel. I have been unable to find out why. The threads of the big tropical spiders are distinctly bitter to the taste, but though the first thought a man has when he tastes anything bitter is that it must be good for medicine, the only use the healing art makes of spiders' webs is to use them to stanch the flow of blood. The kind of web used for that grows under the counters of groceries, and it was one of these spiders that caught a mouse. I will admit, right in the beginning, that this looks like a pretty large story, but it is substantiated by no less a personage than the late Proctor Knott, who was then Governor of Kentucky, though his greater claim to fame is his speech in Congress about Duluth, "the zenith city of the unsalted seas," as he humorously called it, which is very far indeed from being anything nowadays but a plain statement of fact, as he lived to see. Governor Knott made a signed statement of the event and sent it to Professor McCook, whose authority on the spider question nobody will dispute. He saw the spider shortly after she had snared the mouse by the end of its tail, and while it was still alive and struggling halfway off the ground, and he saw it after it had been hoisted nine inches from the floor and all wrapped up in silk. He calls particular attention to the way the

spider kept stirring up the mouse by biting it so as to get another line on it. I can just imagine that spider after she had worked all day hauling on lines and holloaing, "Yo-hee!" to her children that were helping her—if, indeed, they didn't stand round and let her do all the work. "Law!" she gasped, when the prize was finally landed in the nest, "I'm just done out! But, my! 'Twas worth it. Phew! Why, come in, Mrs. Linyphia. Haint seen you I don't know when. Children, get up and let Mrs. Linyphia set down. Aint you got no manners at all? Run along now and don't be gawking at the company, like you never seen nobody before. Yes, I done it all myself, and it just about tuckered me, Mrs. Linyphia. I don't know's I'll ever get over it. I strained my back turrable lifting so hard, but I thinks to myself, 'I'll mebbby never git another chance to git so much meat in to once, and my family is such turrable eaters.'"

And this adventure with a mouse is not the only case on record where spiders have done deeds of high emprise. The Hon. David E. Evans, of Batavia, N. Y., saw a striped snake nine inches long caught and killed by a spider, its mouth shut up with threads of silk and its tail tied to a knot so as to form a loop, through which was reeved a cord as strong as sewing silk made of multiplied threads and run up over a sort of pulley of which a dead fly was the core. Maybe you think that is a pretty able-bodied yarn, but what do you call the statement that a *Dolomedes* spider has been seen to catch and land a fish? No, I'm sure I've got it right. It wasn't the fish that caught the spider. There wouldn't be any story in that at all. It was the spider that caught the fish. It leaped on the fish's shoulders, and bit and bit and swung ashore and fastened lines till it warped the fish out of water. It

wasn't a very big fish, I grant you, if one may go by the picture in the book, but it was a fish, and that is wonderful enough in itself.

Comparatively few spiders spin webs, though. Most of them hunt their prey and regularly run it down. Also, they have to look out for themselves, for spiders are re-

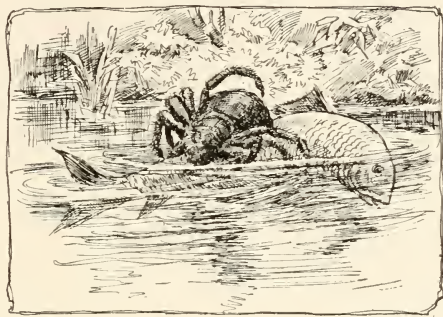


Fig. 32. *Dolomedes* spider, capturing a fish.

garded as good eating by the most discriminating epicures of the animal kingdom. So some of them line holes in the ground with silk for their homes. Sometimes their own bodies do for the front door. They are shaped like a champagne cork, and as they crawl in tight there is nothing for the robber to take hold of. It is like trying to open a bottle with your fingers when the cork is driven home. Others have hinged doors covered with moss, so that they will not attract notice, but if you are inclined to marvel at the intelligence of these little animals, pray suspend judgment a moment. Moggridge took away the moss-covered lid of one of these homes and dug up all the earth around. The spider made a new iid and put moss on it, though thereby she made it the most conspicuous object in the neighborhood.

In some of these tubes in the ground spiders build a sort of a Y with a trap-door shutting off one arm; it works just the same as if they had thought it all out thus, "Now, some creature will chase me in here. I'll run up the side arm and shut the trap after me. It will go on down to the bottom, and I'll open the trap and there I'll have him penned up, and I'll kill him when I get ready." So also the spiders that do side-steps. They must reason, or some ancestor must have reasoned for them thus: "All of our enemies figure that we will run forward. Well, I'll just fool 'em. I'll take a hop to one side." Also when the *Nephila plumipes*, a big black-and-yellow person that hangs in her web in plain sight, sees an evil-disposed bird making for her, what does she do? She vanishes. Run? Never. She vanishes, I tell you. Stays where she is, but goes out of sight. She shakes her web so violently that instead of appearing to be a big, fat, juicy spider there is only a haze where she was. *Pholcus*, the long-legged cellar-spider that spins an irregular web, in similar circumstances swings its body in a circle so fast that it cannot be seen. Orb-weavers scatter rubbish in their webs till they look like old things that have been deserted two or three months, and then they get in line with the chips and bits of bark that they themselves have put there. The trick of imitating spots on grass-stems, scales on trees, lichens and the like, is wonderful. Some spiders have found it a paying proposition to look like the stamens and pistils of bright-colored flowers. There they stand by the hour with their yellow forelegs stuck up stiff into the air. A butterfly comes along and alights to suck honey. He never gets away alive. The resemblance is so close that botanists are deceived. One kind of a spider spins a little round patch of white silk on a leaf. It sits in the center. The outer edge

of its body is a light, grayish-green, merging into white. In the center of its body is a dark spot. An entomologist was once quite curious to know what could attract butterflies to birds' droppings. He tried to pull one away from it. He found that he had made the same mistake that the butterfly had. The reason why it didn't fly away was that the spider had hold of it and was sucking its blood. Some spiders not only look like withered flowers lying on the ground, but have developed a perfume like jasmine. Some look like snail-shells, and one smart *Salticus* disports herself on sunny walls and fences after this fashion: She walks hurriedly, stops abruptly, rapidly moves her jaws as if she were cleaning her front legs after she had rubbed the dust off her wings, only she hasn't any wings. Some one of the horse flies behaving the same way opens conversation: "How do you do, sir? Nice weather we're hav—— Help! murder! watch!" but *Salticus* has him all right.

A fair test of the enemies any animal has, its tastiness, and its skill in evading foes, is the number it has in family. So, if a spider lays hundreds of eggs at once, it is a sure thing that the mortality in her race is very great, in spite of her tricks of make-up. But one araneid, called the *Synagcles picata*, lays only three eggs, and yet there is no scarcity of the species. That it has so great immunity is due solely to its powers as an actor. It does not jump nor walk in a straight line, but runs in zig-zags exactly like an ant that is hunting. The real ant at other times runs straight enough, but *Picata* always zig-zags. Other spiders always remain motionless while eating; ants always twitch their abdomens. *Picata* twitches her abdomen while she eats, beats the ground with her fore-legs, and pulls her food about. More than that, she is got up to look as nearly as possible like an ant. To be

sure, she has only two segments to her body while the ant has three, but the first segment is narrowed in so as to look as if it were properly divided. It has never been seen to eat ants or prey upon them, but it may be depended upon that the fraud pays, or it would not be kept up. Without knowing too much about it, the entomologists suppose that *Synagles*' life is safe because an ant is a pretty uncomfortable customer to tackle. It is hard and horny in its shell; it bites and its comrades bite, and worst of all, it is sourer than all get out. Next time you pick up a nice sweet harvest apple off the ground, don't brush off that little ant before you bite, but chew up ant and all. It won't hurt you, but dear, dear! rhubarb and green gooseberries are not to be mentioned thereafter. It is the formic acid in the ant that makes your mouth pucker. A long time ago they used to make chloroform out of formic acid expressed from ants.

Some spiders are very beautiful indeed, and this is one of the reasons why it is known that spiders have a color sense. It is pretty certain that they cannot hear, or if they do, they sense it as a vibration, not as a sound. But when a spider is as white as milk, with a crimson stripe on each side of her abdomen, it is tolerably certain that this coloration helps her to get a beau. Of course, it also indicates to other creatures that she is a particularly bitter pill. Animals that are gaudily colored and swagger about are regarded as wisely left alone. I am looking straight at you, young man, as I say this, and you may take it from me that it is good, sound sense. There is more in these few words than meets the eye, and you had better chew on it a little.

As a general thing in the world below us, it is the male that has all the fine clothes, but, with some exceptions, it is the female spider that bosses the ranch. This beau-

tiful, milk-white spider with the crimson trimmings has a little runt of a husband that goes about in plain brown, with dark markings, and he is lucky to be alive. As a rule, in spider-land the males are undersized. They don't last long. It is a kind of a hard world for he-spiders. Imagine how it would be if a man's wife were thirteen hundred times as big as he was. He would have to take all her impudence and back-talk without a whimper. I'm glad I'm not a spider—at least, not a he-spider. When he goes courting, his girl treats him meaner than a dog.

But even the spideress with the highest principles will finally succumb to the charms of some young whiffet or other, but if he stays around the place he has to understand distinctly that he must keep out of the way. She's got a lot of things on her mind and she can't be bothered with him. He knows what she means. So he hops around, hangs to her when he can, drops when he can, dodges when he can, but you know what the upshot of it always is. One day there is a withered he-spider skin hanging in the web and the widow stops and looks at it before she throws it out. She smacks her mouth. "Well," says she and draws a long breath, "he certainly was good to me."

The jumping and running spiders are really most interesting to watch in Love's brief delirium. Then they put on their nicest clothes and do all sorts of cake walks

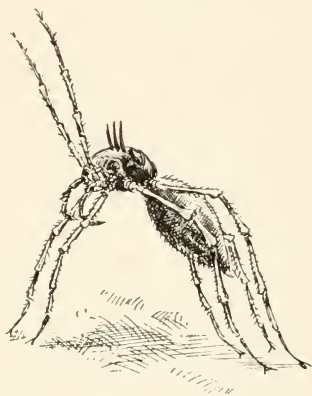


Fig. 33. Spider, exhibiting his charms before the female.

and dances for each other. The *Icius* has regular assembly balls, the men dancing in front of the women and showing off their fancy steps. Every once in a while there is a scrimmage at the lower end of the hall, and all the fellows skate down there, and you'd think by the fuss that there was nothing less than murder going on. The women wring their hands and moan, "Aint it awful? It's jist disgraceful. If I'd 'a' knowed it was goin' to be like this—— Oo-oo! did you see Riley paste him then?" The young things cry and carry on, but the old matrons fan themselves and gape and talk about their rheumatism. They know that it is all got up to impress them, and that nobody gets hurt.

Phidippus morsitans is considered about the best dancing species, and when the male rigs out and goes sparking it is a sight to see. His first pair of legs is long, and he waves them about and stretches them up in front of the lady, as much as to say, "Hail, great queen! Sovereign of my heart!" They are white, plummy things and ought to captivate her, first thing. But she sulks and sometimes she makes a dive for him and he has to drop the "Hail, great queen" business and take to the woods. But if he once can get her to watch his dancing, her heart is his. He stands up as high as he can on his four right legs and crouches down as long as he can on his four left legs and circles about, getting closer and closer to her. She rushes at him. He retreats; he is coy. Then he changes legs. He stands as high as he can on his left legs and crouches on his right set. It is when he is going away from her that the poor girl catches her breath in ecstasy and literally stands on her head. After he has circled about 120 times, she exclaims: "Take me! I am yours."

All spiders do not kill and eat their husbands. *Linyphia* live happily together in one web, and *Dolomes*

mirabilis will defend his little ones. I suppose that is why he is called *mirabilis*, for it is only too true that domestic life among the araneids is a tough proposition, as a general thing. Mamma eats papa and little Dorothy eats Harold, unless Marguerite catches him first. One of the things that make the rare tract of Raymond Maria de Termeyer on spider silk such delightful reading is his horror at the cruelty and rapacity of the female. Poor de Termeyer! He was at great pains to bring up a lot of *Diadema* spiders, fed them assiduously with flies caught by his own hands, found out how to put a rig-a-ma-jig across their bodies so as to keep them from cutting off the thread with their hind legs, and invented a reel so as to wind silk out of them by the hundred yards at a time. He had his servant Lucrezia spin the silk into stockings for his serene majesty Charles III., of Spain, the first stockings ever made on this earth out of spider's silk, and sent them to the king, and—that was the last he ever heard of them. The Count of Florida Blanca said the king got them all right, but there never was a "Thank you" or "Aren't they nice?" or anything of the kind. I fancy it must have been that the gift came at an inopportune moment, when affairs of state were at a critical point, say like this: "Twenty-seven and a run of three. Got you that time. Oh, look here! How can you peg six? Where's your run of four? Well, but that's only four and you pegged—oh, yes. I see. Two for the thirty-one. What is it, Florida Blanca? Oh, of course you'd have a nine! I never saw such a man to peg. Stockings, eh? Got more stockings now than I know what to do with. Twenty-two and a pair. Oh, you bet you'd have another one for a pair royal. It's a go. Well, what do I care if they were made of spiders' silk? It's a go, I said. Spiders' silk! The idea! Does

he think I'm a fool? One for the last card. You can't do anything with spiders' webs. Where's your fifteen-six? Fifteen-two, fifteen-four—— Oh, yes, that's all right, I guess. Lemme see what I got. Oh, run along, Florida Blanca. I don't care what you do with 'em. Don't you see I'm busy? Not a blame thing in the crib! Well, what do you think of that for luck?"

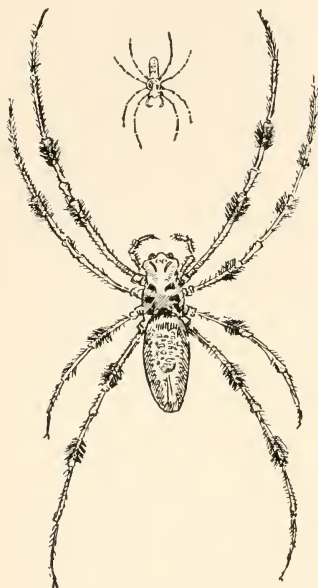


Fig. 34. Silk spider (*Nephila plumipes*), male and female. The smaller is the male.

Not only did the king neglect him, but all the world beside, so that now there is only one copy of his pamphlet in all America. Dr. Wilder has translated it and has written something himself about the silk-producing capacity of *Nephila plumipes*. If you turn her over on her back and pin her down with a shield so as to keep her

legs out of the road, it is possible to draw silk finer and stronger and more elastic than that of the silk-worm from her. She seems to like it for about three hundred yards, and then she quits for a while. But in three days Dr. Wilder spun out more than two miles of beautiful yellow floss. Nothing is more certain than that silk can be produced in unlimited quantities by almost any of the orb-weaving spiders. Nothing also is more certain than that the bother of feeding the creatures and collecting

their silk would cost more than it would come to. If they could be taught to live on hay, say, instead of their fellow-mortals, the spider-silk industry might yet become a pillar of our national prosperity. I should think somebody would undertake the task of converting them to vegetarian principles. It looks easy—that is, compared with some things: for instance, trying to make people sober and temperate when they don't want to be sober and temperate.



CHAPTER X.

THE MEMBRANE-WINGED, WASPS AND SUCH.

OTHER kinds of insects than the hymenopters, or membrane-winged, possess a certain melancholy interest because of their intimate relations to us and what we eat and wear. They may partake of our blood and our food and live in our houses, but they do not partake of our nature. When, however, we come to the consideration of wasps, bees, ants, and such, we feel a sense of kinship, for these are the men of the six-legged world. They are all nice, clean, intelligent people, and though we may feel fear of them and the way they can bite and sting, we do not loathe them. They have so much sense, particularly the social kinds; and even if the ant does seem a rattle-brained, fussy creature, invariably going the wrong way and climbing over things that it could far more easily go around, it probably isn't because it doesn't know better, but because it cannot see better. In no other way can I account for the fact that when Sir John Lubbock laid a paper-strip path from an ants' nest to a place where he had put their pupæ, so that they could either walk nine feet to get home or drop down half an inch, they preferred the walk. They went to the edge and looked over, but they feared the jump, and it never occurred to them to heap earth up so as to make an embankment on which to climb and so save a long trudge. Bees, though quite as intelligent as they need to be, were shown by the same

naturalist to be surprisingly slow to learn that a glass window cannot be got through. Time after time the same bee that had vainly bumped against the pane and had then found the other way out, tried to get through the glass instead of shaping its course straight for the practicable exit. But a wasp does not get fooled more than once. It is for the bee-master to get used to his bees, and not his bees to him. So far as I know they do not seem to regard him as a friend, but it is quite possible to tame wasps, only you must be careful and not mistake a wild one for a tame one. A wasp resents familiarity on short acquaintance. Pastor Müller, away back in 1811, so won the confidence of a whole community of them that he could cut their nest open, could even take it away from them, and they would sit patiently in the hive he made for them, waiting for him to bring it back to them. They seemed to know that he meant well, no matter how strangely he might act.

A tame yellow jacket, kept under a tumbler, is said to have turned its head and pointed its antennæ at its keeper whenever she appeared. I love to read of such things, just as I love to see the lady in the circus put her head in the lion's mouth. It fills me with admiration, but not ambition to go and do likewise. I have not the slightest desire to have a pet wasp to lick honey off my finger or cuddle down in my warm hand. I am friendly to wasps. I always have been. Even as a boy, I could not endure to see a hornet's nest disturbed. If any other boy tried to destroy it with a pole, I went right away from there. I would not stand by and witness such a wanton attack upon the liberties of another. Some may sneer at this as the policy of "scuttle," but it is my firm conviction that when you have interfered, without any call to do so, and stirred up a hornet's nest, and there is nothing

but trouble to be got—plenty of that, though—by staying around, it looks kind of slack-witted not to “scuttle.” It may be brave to stand your ground, but it isn’t very bright. I cannot see, either, that there is much difference between the hornet’s nest in Phillips’ woods and the one in the Philippine Islands. I think there will be about the same solid comfort to be got out of taming one as the other.

The sting in many of the membrane-winged order is a contrivance to bore a hole to lay eggs in. The poison keeps the bark from growing together over the egg and smothering it. Their stinging the oak causes the galls on it from which ink is made, but why the poison should evoke that peculiar growth is a little too much for our understanding just at present. Near akin to these gall-flies is the *Blastophaga*, an insect on which, if it consents to take out its citizen papers in this country, depend all the hopes of California fig-growers. Figs they have long been able to raise; nice, pleasant fruit to eat when ripe and fresh, but a disappointment when dried. They lack the rich, ripened seeds of the Smyrna fig. The seeds are there, but hitherto they could not be set because there was no way of getting pollen to them except by poking it into the fruit with a toothpick dabbled in the flowers of the male tree. After many vain attempts, in June, 1899, the *Blastophaga*, imported from Greece in the wild figs wrapped in tinfoil and plugged with wax, developed, came out, flew around, and pollinated the California figs. The fruit resulting was fine. It is too early to tell whether this particular importation of insects will die out, but it seems tolerably certain that before long California will produce dry figs as good as anybody’s. It all depends upon the *Blastophaga*. If it will please live——

The wild fig, or caprifig, is the only fig that has male

flowers; the edible fig is always female. The caprifig produces three crops of fruit, one called "profichi," one "mammoni," and one called "mamme," which hangs on the branches all winter. The fig insects winter over in the "mamme," lay their eggs in the "profichi," and develop a generation within it, each living in the swelling of a modified and infertile flower. They come out covered with pollen. They try to get rid of it, but in vain. The fig-tree has quite a little sense, too. It belongs to the Charity Organization Society. If these insects want to board with it all winter they must expect to do a chore or two when asked, carrying pollen and such, and there is to be no getting out of it. So the pollen clings to them like a good fellow, and when they go into the flowers of the young Smyrna fig it goes along, too, and sets the seeds. That is about all that is known of the fig insects. What becomes of them during the second crop of caprifigs, the "mammoni," is something that remains to be learned.

Another insect of this order that has done some service to the state is the chalcis fly, a parasite on the caterpillar that used to damage the cotton crop of this country to the extent of fifteen million dollars a year. The almost complete destruction of this expensive pest is due to the chalcis.

It is a pity that the little parasitic wasp, *Pimpla*, could not have arranged it better, else the tussock moth that plays such havoc among the foliage trees of the Eastern States would soon be only a memory. But what is called "the balance of nature" interferes, as it frequently does, to point out to us that we are not the whole show by any means, and that just because we like to have nice shade trees is no good reason for our being permitted to have them. Other folks have to be considered, too. This is

the way the "balance of nature" operates in this particular instance: The tussock-moth caterpillars destroy the leaves on the trees. Then the *Pimpla* gets very plentiful and the majority of the caterpillars are stung by it and never come to maturity, because the young *Pimpla* eats the insides out of them. But *Pimpla* has a parasite that eats its insides out. When *Pimpla* is about exterminated

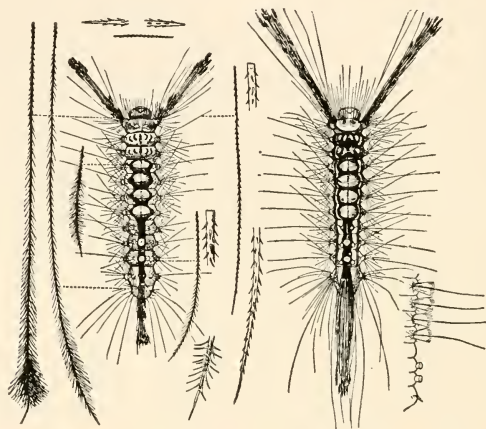


Fig. 35. Tussock-moth caterpillar, third and fourth stages.

there is nothing for this parasite to eat, and nearly all of them starve to death. By this time the trees have got their strength back, and an era of great business prosperity sets in for the tussock moth remaining. Then the few *Pimplas* find plenty to do and multiply enormously. So do their parasites, and thus the wheel goes around, with us and our preferences entirely outside it.

To this membrane-winged order belong the insects most useful to man, prime among them being the bee, to which a later chapter will be devoted. They deserve a book, but unless a man knows more and can write better

than Frank R. Cheshire, there is no use in trying. Ah, gentle reader, there is a book that was worth while to write just as a piece of literature, to say no more. If you have not read it, a great pleasure awaits you. Ants, too, though not so immediately valuable to man, have undoubtedly done him a great service in stirring up the ground and making it fit for cultivation, although we probably have to thank the common angle-worm that we have any arable soil at all. Ants I will speak of in the next chapter, but just now I want to say a good word for the wasp.

As I recollect them they were far better marksmen than the Filipinos are reported to be, and as fighters they cannot be surpassed. Hornets are generally strong enough to extract their stings and use them over again, but a yellow* jacket, like the hive-bee, is often irreparably wrecked by the attack. It is not held back on that account, however. It sails right in and plants an argument where it thinks it will do the most good. We make a great to-do about charges at Balaklava and all that sort of thing, where some fool generally sends his men to destruction through not knowing any better, and the men fight on, knowing that they will be killed, but not daring to disobey. The wasp, on the other hand, fights of its own free will for its country, knowing surely that it will be killed, but glad to offer up its life if the good of the community is thereby subserved. I call that real courage.

In civilized communities, where experience has taught it that those who try to teach it to sing the Star Spangled Banner are beings that wear clothes, it goes for a man's bare hands and face, but in sparsely settled countries, where the benevolent assimilators are four-footed and customarily wear fur, if a man attacks it, it snuggles down into his hair, and jabs its red-hot bolo into the

scalp, making hypodermic injections of the fluid extract of anti-laziness. It is this extract that hurts, and not the mere needle-point itself. As the muscle attached to the poison-bag tears out with the sting and keeps on working automatically after the wasp is dead, it should be your especial care, when stung, to pluck the thing away.

The wasp is less fickle-tempered than the bee, and more intelligent; that is, more ready to take up with new ways and so to adapt itself to surroundings. This is so because it seems not quite to have found itself so completely. Evidently wasps and bees are descended from the same stock, for it is hard to tell some kinds of wasps from some kinds of bees, except that the wasps have no brushes for collecting pollen and do not grow hair baskets on their legs to carry it home. The bees have gone into the pollen business and have made a specialty of it. The wasps have become carnivorous, or perhaps have continued to be carnivorous. They are fond of honey also, and some kinds of wasps even store it up, but it is not a first-rate article of honey in our judgment. Only the shallow flowers, such as heal-all, sweet clover, and golden-rod, can supply it, for its tongue is not nearly so long as the bee's. It likes to visit bleeding trees in the early spring to lap up the sweet sap, and it, like the bee, has quite a fancy for fermented drinks; a lady's taste, though, for it prefers sweet wine, and its whisky must have plenty of sugar and water in it. It grieves me to confess that it frequents Nature's rum-shops a good deal, and can often be seen beside fermented fruits sleeping off its drunk and staggering away with an expression that all too plainly says, "Oh, how my head aches!"

The wasp really does very little harm to any except fallen fruit or such as a bird has pecked a hole in. Sometimes an apple on the ground will be reduced to a mere

shell by wasps. Pick it up and you will notice them backing out. If your hand happens to be over the hole they come out of, you are likely to notice it sooner. It is a way they have, this backing out. It pays them.

They hang around butchers' shops a good deal, but the little meat they steal is more than paid for by the number of flies they kill. They are death on flies. Pigs loafing in the sunshine soon get covered with flies, but they don't last long when there are wasps about. Wasps have been seen to catch between three and four hundred flies on two cows in twenty minutes, and, considering that every-one of those flies meant nothing but devilment, wasps cannot but be regarded as beneficial institutions. The white cabbage butterflies, recently imported from Europe, and which have taken possession of the country, are such bad-tasting things that the hungriest insect-eating bird will reject them with loathing, but wasps look upon them with favor. F. H. Chittenden has noticed *Polistes* walking all over cabbage plants, looking for the caterpillars. Out in the sunny part of the patch, where the light was good, he observed that the caterpillars had been exterminated, but where the cabbages were in the shade of trees the caterpillars were very bad. The wasps could not see them well.

It would be an excellent thing for us if we could do for beef, mutton, and poultry, what the wasp does for the things it slaughters for food. It isn't alone what she eats herself, but what she takes home to the children, if she be a social wasp, or provides for their nourishment if she be a solitary. Such a thing as cold storage is obviously out of the question for her, and yet fresh meat is desirable, so she has ways, differing with each subject, of keeping it alive enough to preserve it sweet and yet not so much alive as to be able to get away. She

paralyzes a fly by biting it just behind the wings to destroy the nerve knots there. The little *Laelius*, when it finds a dermestid grub, hops on crosswise and jabs in its sting just behind the second and third pair of legs. She tweaks the hair and legs of the grub, to see if it is really paralyzed or only 'possuming. Her antennæ wiggle with delight as she tugs away. Then she plucks out some hairs and lays her eggs next to the skin, so that they will keep warm, and it will not be far for the little ones to go for their meals. Wouldn't it be fine if beef "critters" could be stung in some way so as to keep them alive indefinitely without food or care?

It is interesting to watch a wasp get her living. When she hears a cicada fiddling away she makes for him, and you can tell the moment he feels the knife, for his regular note breaks into a wild discordant shriek of "Police!" Such a big prize as that the wasp has a hard time getting home, for she cannot sling it over her shoulder like a bag of flour and trudge along with it. She climbs up into a tree with the limp and unconscious cicada. It sometimes takes her an hour to reach a point from which she can get a good long flight downhill toward home. When her heavy burden drags her to earth again she must climb another tree and repeat the performance all the weary way.

Somebody for fun clipped off the ends of a wasp's wings as she was sawing away at a bit of steak at the butcher's. When she tried to fly off she found she couldn't manage her parcel. "Why," said she, "I must have cut off more than I can carry." So she trimmed a piece off and started again with the diminished load. "It seems so heavy for me," she mused, "However, I will make it still smaller, though it will hardly be enough, I fear." When she found that she could not even budge

that, they say it was really amusing to watch her fussing and fuming and wondering what in time ailed her that she could not lift things as usual.

I think myself it was a very good practical joke. Possibly it would have had a little more point to it if the wasp had found out who played it. The great thing in a practical joke is to fix it so that the victim cannot retort. In this instance the thing that keeps me from trying to see how funny a wasp would act with the ends of her wings clipped off is the clipping of the wings. They are very close to the sting, it seems to me. I tell you, the best way to play a practical joke is not to think of it as a joke at all, but to make out it is done in the interests of science. Then if you get hurt, why, you know, sacrifices have to be made to acquire knowledge. For instance, it was inherently a practical joke that experiment the fellow tried to see if wasps had color sense. Whether they stung him or not he doesn't say, though that seems very important to me. I should regard it as such. He took a piece of red paper and stuck it up over the entrance to the wasps' nest.

"Hello!" said the first wasp that came in afterward.
"Been fixing up, I see. Hardly knew the place."

"Been fixing what up?"

"Why, the front stoop. Painted it."

"Painted it?"

"Yes, painted it. You heard what I said."

"What are you talking about?"

"I'm talking about the front stoop. It's painted. Painted red. Who did it?"

"Not me. 'Liza, did you paint the front stoop red? I say, did you paint the front stoop red? Says she don't know nothin' about it."

"Well, it's painted red all right."

"Oh, get out! Who ever heard of painting the front stoop red?"

"Honest, it is. Come out and see."

"Yes and then you holler: 'Rubber!' I know you."

"True as I live it's painted red. No foolin'. Hope to die if it aint."

"Well now, if you're fooling me—— Well, sir, so it is."

"Didn't I tell you it was?"

"Well, of all things! Folks, come out here! The front stoop is painted red!" Then there was a great hub-bub, or whoop-up, to be etymological. Some didn't like it at all. Said it looked too conspicuous. Others objected to these new-fangled ways of doing things, and declared a red front stoop was too much like the Catholics, but by and by they got used to it, as parishioners will when there is a change in the ritual. By and by blue paper was substituted, and there was more excitement and talk of complaining to the bishop and the Standing Committee, but it passed over. The next thing was that the blue paper was taken away and the nest left as it was in the beginning. Then all the High-Church wasps were dissatisfied and went around with their noses in the air. "P. E.," said they scornfully. "Oh, dreadfully Prot."

Then came the practical joke. The red paper was put back and left on for twenty-four hours, after which it was removed and fastened up a foot away. The wasps alighted on it, and crawled through the hole, expecting to find themselves at home. They did look *so* sold when they found themselves still out of doors! The Low Church wasps said then that they always knew that Ritualism was just a scheme to get folks to go over to Rome.

But it proved that wasps have a memory for colors, an experiment rather unnecessary, in my judgment, since wasps are colored differently for different species, which argues to my mind that they have an eye for the artistic. Moreover, each species carries a regular crest or coat-of-arms, almost truly escutcheon-shaped, on the forehead right above the jaws, and the families are to be told apart by it.

Wasps are more sociable than bees. If they meet another wasp, they stop and chat, and perhaps give a little taste of honey to her, even though she may not be of the same hive at all. Bees are very mean about that. They fight bees from other hives. But, on the other hand, wasps do not tell each other where food is to be found. Bees do. Each wasp hunts her own insects and flower-cups. The rest of her nest-mates have the same privilege, but she isn't going out of her way to help them.

They are very tidy creatures, and are always washing their faces and hands and fixing their antennæ with a sort of little pocket-comb they always carry. They get into this habit as men tug at their mustaches when thinking. When the bee goes into the hive she unhooks her front from her back wings, but the wasp folds hers up like a fan with three sticks. Besides humming with her wings, the wasp has a true voice, as you remember I told you the fly has. It does not come out of her throat, but out of the breathing-holes on the side.

Wasps do not winter over as a colony. Come spring, the queen crawls out from some place in which she has survived the glacial period and starts to build an entirely new house. She does all her own work at first. She bites off fibers of wood from rail fences and weathered boards and with the paper she makes from the pulp constructs first a slender stem, to which are attached three

hexagonal cells, mouth downward. When these are half-finished she lays an egg in each and goes on building, gluing an egg in each cell. When nine or a dozen are completed she makes a paper wall so that the nest looks like a gray ball with a hole in the bottom.

The first eggs hatch out and the grubs with round white heads and little brown points of eyes clutch the walls of their cells by their two tail-feet, all they have. The queen goes a-hunting and catches flies and such for them. As soon as the comb jars and they think mamma has come back, open pop their brown horny jaws. She chews up the flies into pulp and goes from cell to cell, feeding them. As the grub grows it must change its original hold, which was two-thirds of the way down, to a hold nearer the upper and closed end of the cell. It has only those two tail-feet to do it with, though in the egg it had a full set. It is a puzzle to me how it is accomplished. Sometimes it isn't. They say that the mother puts it back, but this only tends to encourage awkwardness, and generally, for the good of the race, it is allowed to lie there till it dies. Later the workers carry it out and throw it away. Once it gets fixed in the closed end of the cell with its head hanging down, it can hang on by ruffling up its sides. When it grows all it is going to, its mouth fills with gum, which turns to silk as it dries. It spins a little cocoon of white silk and the cell is much more heavily capped than the baby bee's, so as to prevent too rapid evaporation of the juices of the body.

In the sleep that follows the grub loses its pillow shape, takes on a fashionable waist, and its legs bud out, until finally it is a perfect wasp, as white as snow. It grows darker, sheds its last delicate covering, snips its way through the capping of the cell, thrusts out its head, and

the very first thing it does when it comes out, brand, splinter new, is to clean its antennæ.

The first ones to come out are workers, not so brightly colored as the queen. When one of them wants something to eat, the queen feeds it. Perhaps it has some sort of a fondness for the cell in which it has spent five days in the egg, nine days as a grub, and thirteen days as a pupa, for while it is yet a young adult it creeps into an empty cell, but, dear friends, things can never again be as they were with any of us. The simple, trusting faith of childhood when one hung head downward and opened one's mouth at every jar of the comb, confident that it was mother come with something to eat, is gone forever, and the young wasp goes into the cell sting end outward.

Now that the young workers are able to do something the queen gives all her attention to laying eggs. The children do the housework and build the additions. Wasp after wasp comes in with a wet pellet of paper pulp and draws it into a cord and flattens it out with her jaws, until it is a little ribbon. Nobody is foreman of the job and gives orders where to put this and that, but all work anywhere and seemingly anyhow. Dr. Ormond thinks that only the young wasps do the building and nursing. They are larger and not so ragged-looking compared with the older ones, which seem to have all they can do hunting. The nest keeps on growing and the combs hang from each other; the stout pillar being in the center, and other pillars where necessary. The top of one comb is the floor of the public hall to the apartments overhead. It is not as with the bees that build their combs up and down, with horizontal cells backing each other. Toward the end of the season the cells get bigger, and the workers are almost as large as the queen.

As with the bees, some are told off to fan and keep the

house ventilated. As with the bees also, the fertilized eggs bring forth workers and the unfertilized the drones. I will tell you of a rough-and-ready way to determine which is a drone wasp and which isn't. Catch one and squeeze it gently in your hand. If you feel a sharp pain it is not a drone, for drones have no sting. After the drone eggs are laid the workers build still larger cells, feed the grubs well, and rear perfect females or queens.

At the first sign of cold weather no more comb is built, no more eggs are laid, everybody knocks off work and goes out for a good time. The house goes to rack and ruin. Who cares? There is honey in the golden-rod, there are swarms of flies and bugs to eat, and rum aplenty in the rotting fruit on the ground in the orchard. The children in the nest opening their mouths for food whenever the wind rocks the house—oh, bother the little brats! They've made trouble enough. French wasps are said to kill their babies before they go, but American wasps are too tender-hearted for that. They cannot bear the sight of suffering, so they leave and let them starve to death. All the same, the grown wasps have a rattling good time until the frost nips all of them, except the queen that creeps into some cranny and goes to sleep, but not so sound asleep that she cannot sting. One cold night last winter I picked up a piece of gunny sack in the attic, meaning to make some use of it, I forget what, and I am able to assure you that queens do sting in their sleep.

Solitary wasps have no workers. They are male and female, or, rather, female and male, for the latter is almost superfluous, though the little black carpenter wasp stands guard over the nest while his wife is out hunting, and when she returns helps her put her victims in the nest. It is the female mud and mason wasp, though, that chisels out the mud, singing gleefully all the while as she

makes the cells for her young. She has no experience with anything but the egg, has never seen a pupa, but she builds each compartment just the right size. I wish you would tell me how she gauges it. By instinct, you say. A very satisfactory explanation. Very. What is the cause of B? Why A, of course. And what is A? That which causes B. Animals are enabled to do sensible things by instinct, and the definition of instinct is that it is that by which animals are enabled to do sensible things. Let me tell you what I think about instinct and a few other such words that succinctly answer the riddle of the universe. I think they are cheeks drawn by us on a bank where we have no funds.



Fig. 36. Spider wasp.

The mason wasp catches spiders, paralyzes them with her sting, lays an egg on the under side of the first one, and then packs the cell full of victuals. The mason wasp has three or four cells in each of several tiers, but the carpenter wasp makes a separate hole for each egg laid. She has her own troubles, for there are other membrane-winged creatures too shiftless to build them nests, and while the industrious one is out hunting, the cuckoo wasp slips in and lays her own egg instead. The carpenter wasp has to look out for *Chrysis*, and what a temper she gets into when she finds one flitting about! On this account *Ammophila* is very careful about hiding her nest in the ground when she leaves it to get more provisions. Certain individuals of a species are more particular than others in hiding their nests. They use pebbles to tamp down the soil into them, to fix it so that none may suspect that the earth has been dug up. Others take less pains.

And it is no mere unthinking instinct that teaches them where to find the nest again. They take the bearings of the spot, and when they return they knock on the ground till they find the place that sounds hollow. They are very clever about catching spiders, too. They slip noiselessly around back of the entrance and wiggle their antennæ before the door. Out pops the spider and in pops the sting. Then the wasp tries again. There may be more big spiders inside. No? Coast clear, eh? Then she goes in, kills all the young spiders, and carries them off.

A caterpillar rolled in a leaf is fairly safe, but the smart wasp cuts a hole in one end of the roll. That does not get her to the caterpillar, so she goes to the other end of the roll and makes a fuss. The caterpillar, anxious to escape, crawls out of the opening, which is what the wasp wants, and she stings it. If it is too big to carry at one load, she cuts it in two and makes another trip. If her prey is where the ants can get at it, she does not always find it when she comes back, so she often hangs it up in the fork of a weed out of the way while she digs her burrow.

A wasp was observed hanging by one foot to a twig and munching away at a fly, which it held in its two front feet. Its other legs and wings stuck out all ways for Sunday. Its jaws and antennæ kept in rapid motion, and as the fly was turned over for the juicy spots it reminded the observer of a man in holiday mood swinging in a hammock and eating an apple.

I think wasps are pretty close to the "cinther of the wurruld."



ANTS.

“Go to the ant, thou sluggard; consider her ways and be wise: which having no guide, overseer or ruler, provideth her meat in the summer and gathereth her food in the harvest.”

FOR the measured melody of these lines, which come to us like a beautiful song heard in childhood and ever since forgotten, we must give credit to King James' scholars, but I like to think, in spite of what the higher critics say, that the sense is King Solomon's, and that he, the Augustus of the Jewish empire, found time amid all his multifarious duties to get down on his hands and knees in the back yard and watch the busy emmets at their work. When you remember that he was the chairman of the building committee of the temple, and any parish vestryman knows what that means; when you remember that he was judge of his people as well as their king, and had to hear police-court cases and make Mrs. Ryan stop calling Mrs. Cassidy out of her name up the air-shaft; when you remember that he wrote a thousand and five songs and three thousand proverbs (hardest things in the world to get right; poetry is nothing to them); that he spake of trees, from the cedar that is in Lebanon even to the hyssop that springeth out of the wall, he spake also of beasts and fowl and of creeping things, and of fishes; and when you remember that on top of all he had a large and expensive family to keep, seven hundred

wives, all princesses in their own right, and all quarreling about who should go down to dinner first, I hope you will appreciate the worth of the man that wrote the saying which heads this chapter. He was a nice fellow. He belonged to our lodge.

I am all the better pleased with King Solomon now that he has been vindicated, for I don't mind telling you that there was one while when he was rather under a cloud, as far as entomologists were concerned. They were free to admit that the wise king might have *thought* he saw ants carrying cereals into their nests, but they said that an inaccurate observer might easily mistake what the bird-fanciers call "ants' eggs," but which are really ants' cocoons or pupæ, for wheat, which they much resemble. But real grains of wheat, oh, never! Ants' mouth are made to bite, not chew, and they live on juices which they lap up with their tongues as a cat laps milk. More than that, Huber and many other students had watched ants for years, almost every hour of the day and night, recording everything they did, and not one had ever seen an ant eat a seed or even bring one into the house except violet seeds, which look enough like cocoons to deceive the very elect.

It made no difference that the classic writers spoke of ants storing cereal and other grains and that Claudius Ælianus told how they twisted the seeds from herbs and cast them down "to the people below"—quaint phrase that—it made no difference that the Talmud gave decision as to whether the owner or the renter of land was entitled to the contents of the emmets' granaries found on it (I forget which it was, but you may be sure that the ants had no equity in the matter; the constitution does not apply to them, *ex proprio vigore*, or *ex any other vigore*). None of these things moved the entomologists, who went

right on holding the views of the celebrated John P. Robinson.

“John P.

Robinson, he

Sez they didn't know everything down in Judee.”

But one day a physician snuggled his ear up against the chest of a scientist named Moggridge, had him breathe hard and say, “Ha!” and advised him to spend the winter some place where it wasn't so cold as in England. There was nothing to be alarmed about, but—one guinea, yes, and don't go out without overshoes. “Ordered south.” When we hear that fateful phrase we sigh and cannot help ourselves, for we know the ending of that story. But Moggridge was not the kind of man to sit out in the sun at Mentone and wonder whether his cough was really better than it was the day before. He went out on the warm slopes and watched the ants fight. One nest he saw carry on a campaign against another nest from January 18 to March 4, murdering and pillaging and kidnaping baby ants, and otherwise establishing a stable government, when all of a sudden a thrill shot through him. Part of the plunder was seeds! They were right, after all, Solomon and the Talmud, Plautus and Ælianus. Life was no longer a matter of avoiding draughts and remembering to take the brown medicine every three hours and the white medicine before meals. He had something to tell the world, and though he might die before his time, yet he would live forever, perhaps not in the memories of the common herd, but in the memories of the men that he would choose for friends and companions, the men that would know and understand. And then, as the sweet spring of Southern France ripened into summer he saw the ants gather their harvest into the garner, just as Ælianus had said they

did, one gnawing at the peduncle and the other twisting off and casting "to the people below" the seedpod of shepherd's purse, which we Americans often call pepper-grass and twine among the birdcage wires for the canary.

He played a little joke on these ants. He strewed porcelain beads in their way. With high triumph they fell upon the pretty shining seeds and carried them home. He never found out who it was that told them: "Well, aint you the big fools to be luggin' them things into the house! For half a cent I'd make you eat 'em. Why, them aint seeds; them's stones, you gumps. T'row 'em out, every one of 'em. Here, you! Come back here and carry out that stone you jist now brung in." But somebody must have spoken words of wisdom of this import, for they immediately brought out the beads and dumped them far from the nest, and when, thereafter, an ant went by a bead she never let on she saw it.

Other observers in warm climates soon verified Moggridge's discovery. Dr. Lincecum, McCook, Mrs. Treat, and others found that ants not only collect and thresh out the seeds of *Aristides stricta*, or ant rice, but that they weed out all other growing things from the garden spot about their nests. When the crops are gathered in they clear away the stubble. Dr. Lincecum is convinced that they seed down their gardens, but other observers shake their heads and say that is a little too much. They are willing to admit that the harvester ants pave the top of their nests with little white stones, and that they cut roads through the grass so as to facilitate commerce, because they have seen the emmets do that, but planting the ant rice for next year is more than they will subscribe to. It is pretty certain that, in order to make the hard grains edible, they are allowed to sprout a little and then are stopped by nibbling away the root tip. The ants can keep

grains from germinating when they can get at them. The sprouting seed softens and splits. The starch ferments and turns sweet. The ant licks up the goody. So far as known, no ant has taken the next step after malting, the brewing of beer. They chew tobacco, at least, the leaf-cutting ants do, but they don't indulge in any intoxicating beverages.

I often think that the grasshopper La Fontaine tells about in his celebrated work, "First Steps in French," must have sauced back after he got the offensively virtuous answer to his polite request for a cold bite or at least a cup of coffee. He was an actor out of work, singing at the summer resorts, and now that the season had closed—"You sung all summer; go dance all winter," said the ant, and slammed the door in his face. "There are others," bawled the grasshopper, going out of the front gate, and that is true, too, for almost no ants make provision for the winter months. They simply go to sleep and wait for the spring trade to open up. But if in colder climates they do not engage in agricultural pursuits, there is a kindred industry in which they are quite successful. I mean the dairy business.

Like the rest of us, they have a sweet tooth. Now, honey is produced by very many plants in their blossoms, but not for ants. Flowers advertise quite extensively, but only for flying customers. They hang out bright colors and bunch themselves together so that any bee or butterfly that is not totally blind may find them. In the case of the rhododendron they even go so far as to point out, "This way to the bar." For the evening trade they dress in white and are strongly perfumed. But when an ant comes around all the honey-bearing flowers shake their heads and say: "Nothing for you. Not today. No, no! Go on away. Get out, now, or I'll set

the dog on you." Some defend their blossoms with regular *chevaux de frise* of bristles and stickers; some make their stems gummy and hairy; some, like the snap-dragon, shut up so tight that an ant cannot get in, while others hang their flowers away out on such slippery and shaking stalks that the ant falls off before it gets to them. Some open early and close early, knowing that bees rise betimes while ants are notorious slug-a-beds. But that there is a determined purpose to boycott the ants is evident from the fact that amphibious plants, when they grow in the water where emmets cannot get to them, omit the defenses they throw up when they grow on the land. On the other hand, some plants, recognizing the fact that ants are great for destroying worms and caterpillars, set out a kind of cheap lunch for them on the under side of the leaves. The acacia even goes so far as to grow hollow thorns as company houses for the ants as well as furnishing them sweet syrup. But I think the smartest trick of all is played by the *Melampyrum pratense*. It knew that the soil on an ant-hill was more than usually fertile and well stirred up, so it sat with its head in its hands for a long time and thought out this plan of action: "Ants like honey. I'll squeeze out a little for them. They think the world and all of their young ones. I'll make my seeds look like their cocoons, and more than that, I'll make them smell like their cocoons. They'll carry 'em under ground, and when spring comes they'll sprout." It worked like a charm, and you will find the *Melampyrum pratense* growing on ant-hills where no other plant is allowed. It looks like a low-down trick to play, but where there is so much competition it doesn't do to be too particular.

The oak is one of the plants that set out honey dew in order to get police protection from insects that live

upon sweets, like bees and wasps and ants. It doesn't need more than one threatening movement with the sting of a *Cremogaster* to make a grub conclude it had better go somewhere else. If the ant does not sting it sprays a stream of formic acid that blinds and maddens its opponent, as well it might, for it is exactly the same stuff that is in nettles. Some ants can spit venom eighteen inches. And, as if stinging was not enough, when an ant bites it never lets go. You can pull its head off and it still grips. When a South American Indian gets a bad cut he does not stitch it up, but draws the lips of the wound together, makes ants bite them, and then snips their bodies off. Their jaws hold the cut together till it heals.

This oak-tree honey has developed a special industry among the ants in the Garden of the Gods. They collect it and store it, not in cells like the bees, but in the crops of their fellow-workers. It is probably the only animal on earth that converts itself into a self-sealing can for the good of the community. They hang to the roof of their dwellings and every time a worker comes in with a load of honey and rams it down their throats, "Oh! oh!" I can fancy them gasping, "that's enough. Oh! I feel as if I should burst. So distressing. Oh, now! Oh, please, please wait till I get this down. What! more? Well, this is the last. Oh, dear! Here comes another." Their little tummies are as tight as drumheads, and they stretch more and more till they get to be as big as a Delaware grape. Their poor little insides are crowded up so that they practically do not exist, and the creature is a mere crop on legs, utterly helpless. When another ant gets hungry it goes up to one of these rotunds and tickles it, kitchy-kitchy, and feeds on the honey it regurgitates. The Mexicans put a plateful of these rotunds on

the table for dessert. McCook says they are good, and that the honey has a pleasant tartness, but adds that he does not think that rearing them for market will ever become a great industry.

Not only do plants secrete honey dew, but aphides, or plant-lice, suck the vegetable juices, convert them into sweet liquid, and give down a drop or two when tickled by ants' antennæ, just as cows give down milk. Whenever an ant finds one of these plant-lice it says, "Nice aphis, nice aphis! Yes, oo was a nice old aphis," and strokes and pets it till the creature exudes its drop of syrup. Some ants are like the Indians, and take their chances of running across a good thing, but others, more civilized, keep aphides in herds, build underground stables for them and covered ways up the stalks of plants, so that no harm may come to them. As I told you, certain generations of aphides are winged. Since they might fly away the ants tear their wings off, leaving a hole in the top of the stable so the undomesticated male aphides may come in when they want to. Just before frost the female aphis lays her eggs, and the worker-ants gather around her and seem to comfort and stimulate her in her task, while they carry off the eggs and store them in the nest. And then when the eggs are laid she can go hang for all they care; they're done with her. She is left to perish in the frost. They don't see as they are called upon to do anything in the matter. Her sphere of usefulness was ended, and if they had to take care of every old, played-out bug that came along—— Why, mercy me!

Delightfully human, aren't they?

The aphides have very formidable enemies, which the ants fight as men fight wolves and enemies of the flock. There is the ichneumon fly, that asks nothing better than to lay an egg or two in their soft bodies, and there is the

aphis-lion, which is very terrible. Its mother, the golden-eyed lace-wing fly, is a dear, sweet thing, that you would think fit only to go on an Easter card, so pale and æsthetic are her light-green wings. But her children are such regular little "divvels" that she dare not lay her eggs in one mass, for the first one out would eat up all the rest. So she spins a lot of stalks of stiff silk and sticks one egg on the end of each, thereby giving each young one a chance for its life. Considering that the ants chase away these savage insects, defend their flocks of aphides, stable them, and keep their eggs over from October till March, does not this constitute stockraising and justify my statement that they engage in the dairy business? Are not the plant-lice truly "ants' cattle"?

There is a lot that is human about these little ants. They like to play and cut up; they make believe to fight, and when they wrestle in fun they roll all around like schoolboys. They wash and brush each other and stretch out under the process as much as to say, "My! that feels good." When they sleep they often lie on their sides, and sometimes squat down on their abdomen and the last pair of legs, for all the world like a man taking a nap. When they wake up they gape and stretch themselves, and all but say, "Ho, hum!" They always wash themselves and comb their hair as soon as they get up, and that without having to be told, like some little persons I know, but will not name here.

They are like us in keeping pets about the house. André counted 584 species of insects, nearly all of them beetles, that are habitually to be found in ants' nests. They must be there with their consent, for an interloper is instantly killed. Some of them are milch-cattle, like the aphides, such as caterpillars that give syrup and the little blind beetle *Claviger*, which secretes honey from a

tuft at the base of its wings. If one of these *Clavigers* is put into the nest of strange ants, they fall upon it and slaughter it at once. Some kind of wood lice are kept as scavengers, and the silverfish or bristletail and the larva of the elater beetle are handy to have around to do the heavy digging under the supervision of the workers. Many of these domesticated animals are unable to feed themselves. Lepses saw some ants eating sugar. A *Lomechusa* of their nest came up and nuzzled them till they fed it. Afterward it climbed up on the lump of sugar, but did not seem to know how to get the good of it for itself. But there are also pets about which are as useless as a pug-dog, if another such a thing in the universe can be imagined. The little *Stenammina westwoodii* pranks about in the hills of *Formica rufa* and *F. pratensis*. It runs along with them, jumps on their backs and takes a ride, and, if for any reason the nest is removed, it goes along.

Then there is another little ant in these nests that is by no means a pet. It digs its galleries in the partitions so small that the big ants cannot get in to kill it. Every once in a while a *Salenopsis fugax* darts out, snatches up a baby and runs with it into its den, where it eats it up. It is as if we had cannibal dwarfs lurking in the walls, and now and then carrying off one of the children to be devoured at horrid banquets behind the plastering.

But if we begin calling hard names we might as well keep it up, and admit first as last that all ants are cannibals and feed not only on other kinds of ants, but even upon their own species, when they are not of the same household. They capture and carry off the eggs, larvæ, and pupæ of other nests, and what they do not have for dinner to-day they fatten for to-morrow. It is supposed that in this way they got in the habit of keeping slaves.

The young captive ants came out of their cocoons, and being naturally industrious they bustled about and gave the babies their nimmy-nimmy when they cried for it, swept the floor, and carried in the coal till the approving workers of the captors began to talk to each other like this: "That *Fusca* is a handy little thing about the house. Seems a kind of a pity to kill her when we got so much provisions on hand, and right in the busy season when help is hard to get. She's so good to the children, too. Let's keep her a while. What do you say?" And then, when it was decided to put off butchering day, they went to *Fusca* and said, "*Fusca*, we've concluded not to kill you for a spell yet. You can stay around and do up the work, but mind, if there are any complaints about you, or the children are neglected, or you give any of your back talk—— Well, there'll be fresh meat for supper, do you understand?"

And *Fusca* dropped a courtesy and made answer: "Yaiss, missy. T'ank yo', missy. Ah'll do de des' Ah kin." (It is almost needless to say that *F. fusca* is a black ant.)

F. sanguineas can do their own work and often do not keep slaves at all, but they are little thought of in ant circles. The real nobility and gentry are *Polyergus rufescens* and *Polyergus lucidus*. Work? *They* work? No, indeed. You don't see them demeaning themselves building and minding the children, collecting food, or even feeding themselves, if you please. When the nest is changed they do not set foot to the ground; they are carried by slaves. They have always been accustomed to having help about the house. But they can fight. Their mandibles are fit only to crush other ants' heads. Huber put thirty of them in a box with honey and a lot of their larvæ and pupæ. What followed reminds one

of the stories of the South in the Reconstruction period. They walked around, picked up the children in an awkward way as if they knew something ought to be done, they couldn't just remember what, and laid them down again. There was honey over there that ought to be served. You, Pomp! Whey is that black rascal at? But there was no Pompey, and they fell to pining for the days befo' the waw. They made them no dwelling. Half of them died of starvation. Then Huber put in a single black ant. Dinah, I think her name was, or Aunt Debby, I won't be sure which, and she began to do about. She built a house and attended to the children, helped the young ants out of their cocoons and fed and groomed the old ones till they were once more able to go about discoursing on the eentellaictual eenfe'io'ity of the niggro, sah.

Ants have cemeteries, and it is characteristic of them that the slaves are not buried with their masters, but in another place, over by the back fence among the ragweeds and burdocks.

It must be confessed that *F. fusca* is not very much on defending its own hearth and home. Let *F. sanguinea* or *P. lucidus* hearken to the call of Duty and Destiny to the strenuous life and its attendant necessity of extending the blessings of civilization, and all *F. fusca* can do is to grab its children and run around like a hen with its head off, screaming, "Oh, Lawdy, Lawdy! Hyah come dem ar Ku Kluckers!" while the superior race walk up to them and slap them over with a "Here, you! gimme that baby. Give it to me or I'll——" And then after the ruin is complete *Fusca* sits and weeps over the wreck.

But it is not always a Manila Bay for the invaders. Some resist and put up a fight that would delight Senator Hoar to witness. I do not know that I had better go into

details. It might be considered treasonable. I guess I had better say nothing more about it, but go on and present the problem that puzzles the entomologists, how *Strongylognathus* and *Anergates* get slaves at all. They are few in numbers, and *Strongylognathus* is hopelessly outclassed as a fighter. It never by any chance slays an enemy, and it displays a gift like that of a British army

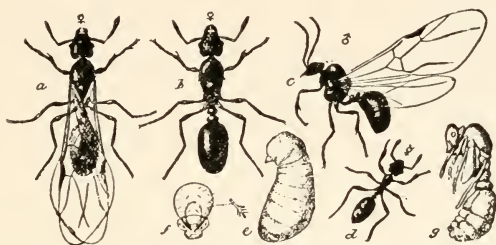


Fig. 37. The pavement ant; *a*, winged female; *b*, same, wingless; *c*, male; *d*, worker; *e*, larva of female; *f*, head of the same; *g*, pupa of same.

officer for getting killed in engagements. The battles are all won by the slaves, the creatures that have their nests under brick sidewalks. They are regular Teddy Roosevelts in war, but the misguided things fight against their own countrymen with a glad heart. Then the *Anergates* does not beget any workers or soldiers at all. They are all males and females and no eggs, larvæ, or pupæ of the pavement-ant slaves are ever found in their nests. Yet they must have slaves, for they cannot feed themselves. They cannot kidnap them, they are not able, and they do not rear them. What's the secret of it? An early answer will oblige many suburbanites who have difficulty in securing cooks, nursery maids, and upstairs girls.

From these high-class ants that never do a lick of work to those that prowls around, dwelling where they

can and living by the chase, incapable of more than the simplest kinds of communal effort, are all the gradations that one finds in human society from the multi-millionaire to the Digger Indian. It is a comfort to be able to announce that among these low savages are the red ants that from living under stones have come to biting away

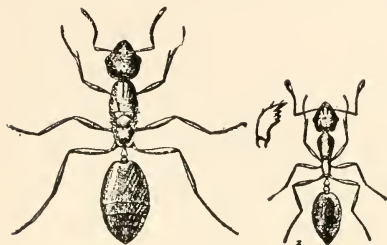


Fig. 38. *Monomorium pharaonis*, the red ant of the pantry; a, female; b, worker.

the mortar between the bricks of houses for their troglodyte dens. There are drawbacks to this mode of living, boiling water for instance, and cotton soaked with poisonous kerosene stuffed in cracks of the

floors, and this dreadful corrosive sublimate which makes ants go mad and bite each other, but then it has its conveniences, too. It is handy to the sugar bowl and the cake box. Some ants make nests of pure silk between leaves, and until quite recently where the silk came from was a dark mystery, for adult ants do not spin. The pupæ, though, secrete a gummy fluid from the mouth, which, when drawn out into a thread, toughens as it dries. The worker picks up a baby as if it were one of these sponge mucilage bottles, dabs its face against the leaf and spins out the silk to build a home. Some ants bore out elaborate chambers and galleries in trees and have developed a kind of worker, a big-headed, flat-faced fellow that stands in the doorway and does his specialty entitled, "The Living Cork." If you know the password, you can get in. If not, you stay out. It does not do the least good to bite

at the tiler. His antennæ are laid back out of the way, but his jaws are quite handy, and if you get into trouble don't come bawling to me. I warned you.

Some ants do not have any nest at all, but just roll up into a big ball when night comes. They move in a column about four feet wide, and everything in their path has to look out for itself except the birds in the trees. Cock-roaches, fool-like, run under the first thing they see and their end is sudden. Spiders show considerable intelligence in getting out of the way, but old grand-daddy long-legs stands his ground, lifting up one leg and then another out of the way till sometimes all but three of his eight are in the air, outwardly calm, but inwardly a prey to the direst fear. It is this ant that makes life in the tropics less of a struggle with certain forms of low life mentioned in Chapter VI. Sometimes our own Western Indians, particularly those that have an old-maidish and fussy desire for more solitude in their clothing, lay their furs and blankets on an ant-hill and achieve the desired results, even though the exterminators are not so destructive as the South American ants that have been seen to kill a four-foot snake. The natives say that no boa constrictor will swallow its victim till it has looked around for ants that might devour it while heavy with sleep.

The formicary Four Hundred, however, dig their dwellings in the earth, and have probably done much to make the soil cultivable. They know the use of the arch, and their architecture shows greater adaptability than the bee's. These homes are practically permanent, since under favorable circumstances queens will live from eight to ten years and workers six or seven. The males do not count for much. Their function is analagous to a penny cake of yeast for the family baking. The males and the virgin queens are winged, and on a September

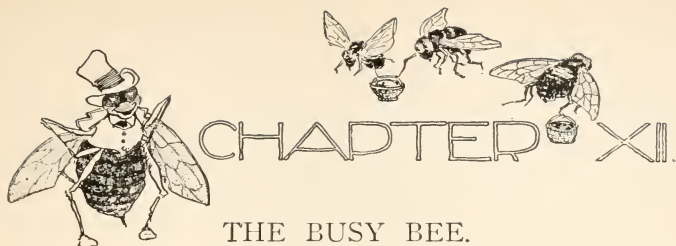
morn they go on a wedding journey. The males fall to the ground and the birds get them. The females come back home, tear off their wings, and start in to lay thirty-five or forty worker eggs. These workers are undeveloped females, who sometimes lay eggs without love, courtship, or marriage. The worst of it is that their children always turn out to be boys. The queens live together without quarreling and do nothing but lay eggs. Once in a while they may take a walk out of doors, but always with a bodyguard of workers attending. It is easy to see how the nest increases in population until it has been estimated that some settlements of *F. crsectoides* in the Alleghanies contain between 200,000,000 and 400,000,000 inhabitants, all living in peaceable relations with each other, all hostile unto death to any intruder even of the same species from another nest.

Now, then, how do they know who's who? Mr. Darwin has well said that an ant's brain is the most wonderful atom of matter in the world, but even so, it cannot be that each ant can remember every one of 200,000,000 fellow-laborers. Keep an ant a year and a half out of its own nest and when it is put back it is recognized as a friend. Sir John Lubbock divided a nest of *fusca* in the spring before there were any eggs. When they had been laid, had hatched into the cornucopia-shaped grubs, sorted by the workers into classes according to their age and size, comically like a graded school; had been promoted into the grammar grade of cocoons and had graduated into mature ants, the divided house was reunited. The old folks at home that had not seen even the eggs of these young ones were civil to them and asked them how they did, and if they didn't think it was nice weather they were having. It was thought that maybe the nursing ants had given the younger ones the password, but when eggs

from one nest were reared to maturity by workers from another nest and then restored to the old homestead, of the forty-four that came back only seven were attacked. How do they recognize their own?

I have pretended all along that they could talk to each other, but, of course, they cannot. Experiments show that the most they can do is to nudge one another, and that they are unable to give directions that will tell their comrades where the food is that they have found. They probably cannot hear, for they do not make sounds. The microphone proves that, for though the ants could be heard tramping about, not one of them was whistling a popular air or calling out to know who had the screw-driver last. Penny whistles blown, a violin played, and the most startling noises that Sir John Lubbock could make with his voice did not alarm them in the least. It seems likely that they do not see very well; which is no more than could be expected when they have one set of compound eyes that see things right side up and one set of simple eyes that see things upside down, as ours do. It must keep them guessing. But they are susceptible to light in much the same way as a photographic plate. Daylight gives them the fidgets, but when it is broken up into the spectrum they prefer the red end to the violet end, and often as it is reversed they pick up the children and take them to the red end. But the ultra-violet rays annoy them most of all, for when the light passed through a solution of bisulphide of carbon, which stops out the actinic rays beyond the violet, they seemed to be about as well contented as if they were in red light. Their sense of smell is what apparently they go by most, and when a brush wet with patchouli was brought to them they laid back their antennæ in ecstasy, as much as to say: "Oh, lovely!"

Well, it's hard to stop, but I suppose I must. There is so much to tell. A gently sad wistfulness comes over one to think how much there is that never can be told unless the human race shall some day rise, as it has risen from the plane of insect life, to an intellectual plane as high above our present one as that is high above the ants. It has been a pleasure to me to write about these wonderful little creatures; I trust it has been a pleasure to you to read about them. And yet, if that were all, I should sigh as any other mountebank sighs when he wipes off the grease paint and changes to his street clothes. I had hoped that through my fooling you might have seen how earnestly I felt that in this universe man does not stand alone, the only thinking being, but that the lowliest form of life, yes, every grain of inorganic matter, throbs with intelligence. We are kin to every living thing. Body and soul we are kin. We are brother to the farthest star, built of the same stuff. Not in humbleness of spirit, but in boasting pride can we say that we are made of the dust of the earth. How magnificent that dust!



ARTEMUS WARD was once asked by his daughter, so he informs us, " Papa, why do summer roses fade?" To which his reported reply was, " Because it's their biz. Let 'em fade."

This compendious answer has the demerit of its kind—it shuts the door on one problem only to open it on a greater, Why is it their " biz " to fade, and why do they bloom, in the first place?

Considering how badly we humans have the big head, it is only natural that we should think that if there were no eye of ours to see and no nose of ours to smell, the rose's petals would have no color and no scent. Nothing but the gigantic conceit of the race could ever have inspired the lines and made them popular:

" Full many a flower is born to blush unseen
And waste its sweetness on the desert air."

It makes us feel a gentle sadness to think their lives are in vain. Bless your soul, plants wouldn't go to all the trouble and expense of painting and perfuming their blossoms just for us to pick off and smell to. They weren't thinking of us at all, but of winged insects, bees in particular. It is for them they spread this banquet of beauty. Why, only for the bumble-bee there could never be more than one crop of red clover. You remember Huxley's paradox that old maids are the support of the British Empire. Old maids keep cats; cats destroy field-mice, which prey upon bumble-bees' nests;

bumble-bees insure seeds to red clover; red clover makes good beef, and good beef makes big, strong men, who extend and keep up the British Empire. Q. E. D.

Our civilized roses, now that they are sure of being perpetuated by slips and roots, have quit trying to raise families and devote all their energy to looking pretty. But the wild rose, that has to struggle for a living, is still male and female. Like all other flowers, it grows a fringe of little filaments that shed a fine dust. Inside this ring of filaments are little upright spikes with raw spots on their tops. If a grain of this dust or pollen gets on a raw spot or stigma it wriggles down through the spike into the knob below the flower and starts a seed to growing. But flowers, as well as human beings, are opposed to the marriage of close kin. The problem the original rose had to solve was how to get pollen from one plant to another. I can imagine the first rose scowling and nibbling her under lip trying to think. "Let me see," says she, "I might trust to the wind, like the pussy-willow, but that's too chancy. I wonder if I could get some of these flying insects to carry a little pollen for me, now and then. It's so handy for them to get around. They're not stuck in one place all the time. I'd have to pay 'em for it, I suppose. They like sweets. I'll set out some honey around the bases of my pollen-bearing filaments. But how'll they know I've honey for them? I'll advertise. Red's an attractive color. So's yellow. You know what the poet says:

"Red and yellow,
Catch a fellow."

"I'll change some of these outside stamens to petals and dye them red or yellow. Then, to call their further attention, I'll sprinkle perfume."

The bees had to be consulted, for if they were to mix up rose-pollen * and honeysuckle pollen and the indiscriminate mixture of the dust of all plants, it would never do in the round world. There must have been some kind of a general convention wherein it was agreed that "a community of interest" required that the flowers should, for their part, keep out all creeping bugs as much as possible by making their blossom-stalks gummy and covered with stickers and fuzz, or else smooth and so dingle-dangly that creepers would fall off, while the bees for their part contracted to visit only honeysuckles on one trip, only white clover on another trip, only loose-strife on another trip, and so on. The red clover, catering strictly to the bumble-bee trade, changed its blossom so that no other insect could get in. Other plants have quit growing pollen in the stamens that do not touch the bee on the right place to rub off on the raw spot in another blossom, and still others are male at one time and female at another, so as to make sure that there will be no scandal of marriages within the forbidden degrees.

The boy's definition of the bee as "the bird that gives honey and stings" is hardly complete. It is more to us than that. Take that knurly apple with the shrunken place in its side. Cut it crosswise, and you will see that the deep dimple marks the place where a seed has failed to grow. What does that mean? That the bee made only four visits to the apple-blossom instead of five. Notice that green spot in the strawberry. When the bee plumped down on the flower, with its stomach pivoting on the round mound in the middle, turning itself to suck the honey out of the little pits at the base of the mound,

* Bees do not get honey from the wild rose, as a matter of fact, but I had to have some kind of a popular illustration, and since the rose is the best-known flower, it did as well as any.

by some mischance the pollen it had got itself besmeared with from another strawberry blossom failed to catch on the fuzz over this part, so there no seed was set. The fruit crop fails less because the frost nips the blossoms than because it is too cool for the bees to fly.

This, then, is why the summer roses bloom. Why do they fade? Why does a man that once dressed himself with punctilious care when he went into the presence of a certain woman now appear before her with his collar off and a pipe in his mouth? Who keeps on running after he has caught the car?

Specifically this is true of the hive-bee, but it is also generically true of nearly all bees, except the kinds that have learned the great truth that the poorest way of getting a living is earning it. An instance is the *Apathus*, which looks almost exactly like a bumble-bee, except that it has no pollen-basket and apparently cannot collect its own food. The bumble-bees resent its intrusion into their nest at first, but seemingly *Apathus* has the same knack that some gifted humans have of appealing to the better side of our natures, our generous impulses that prompt us to succor those who through no fault of their own have been reduced from affluent idleness to poverty-stricken idleness. There is something noble about being no-account and useless, something disgraceful about having to work for a living. This is why we feel so good when we give an alms; we are helping somebody to attain to that honorable estate we were all intended for if an untoward Fate had not doomed us to a life of slavery. We often think how sweet is the gratitude of those whom we thus assist. So it is, or at least I presume it is. I have never known it to exist, but I have no doubt there is such a thing. I have had a considerable experience in this line, and I have noticed that the attitude of the

recipient to the giver is invariably that of contempt. The benefactor is, in plain language, "a sucker," first because he squanders his money and gets nothing for it, and second because he works for a living when it is so much easier to tell a pitiful story and perhaps shed a few tears. Even when the person helped is really industrious and worthy (if anybody is worthy to take money he has not earned), there cannot but be hatred of the benefactor. One has had to confess his inferiority, has had to humble himself. You can never again really like the man to whom you are so beholden.

So I suppose the *Apathus* feels toward the bumble-bees that give it board and lodging, and, if they are like us, I suppose the bumble-bees feel their hearts swell within them and perhaps a tear of joy dims their compound eyes at the thought that they are thus privileged to do an act of kindness to some poor bee that lost its pollen baskets in the Charleston earthquake or the Johnstown flood. "It might happen to me," says the simple-hearted bumble-bee, and goes singing about her work. "There's a sucker born every minute," says the *Apathus*, with a grin.

The bumble-bee is on the road towards the hive-bee. It has workers that attend on the young, and the leathery bags of thin honey bunched together are not wholly dissimilar to the comb of the hive-bee. But unless it takes to building a nest that will last over from one season to another the bumble-bee will probably never amount to anything more than the special agent for red clover and an opportunity for little boys to have a fine piratical fight when they find a nest out in the meadow. The bumble-bee is quite a vigorous stinger, as I remember. We used to bat them with shingles, but I have lately been informed that the truly scientific way to rob a bumble-bees'

nest is to fetch along a gallon-jug partly filled with water. Uncork it and set it near the nest, which is then vigorously stirred up. Run like a whitehead then. The bees come boiling out, buzzing, "What's the matter out here? Who threw that brick? Lemme at 'em. I'll fix 'em!" One goes in the jug to explore, and her humming is so sonorous that the others think there is a fight and go to her aid. The upshot is that they all drown, and it is perfectly safe to steal all the victuals, kill all their babies, and wreck their home. Who wouldn't rob and murder and pillage if it was perfectly safe? Half the fun of war is that you can do all these things and not get arrested for it.

There are other bees not so well known, solitary bees and so uncivilized bees, and yet, for all that, pretty smart in their way. Take *Andrena*, that scissors out circles from rose-leaves; lines a tunnel with them all fitted neatly together, kneads up a pudding of pollen and honey and lays an egg on it; builds another cell above, and so on up to the top. When the grub from the egg first laid has finished its rations and is ready to come up into the air and fly, how does it get out without disturbing those above it? How would you contrive it, if you had it to do? I'll be bold to say you couldn't plan it any better than this little wild bee. The egg last laid hatches out first and so on down, until the first one in is the last one out.

But to tell the story of the thirty thousand bees known, to say nothing of the vast number uncatalogued, would be too much. Let us get back to hive-bees and their usefulness to flowers.

Bees collect their fees as matrimonial agents, not only in honey, but in pollen also. Plants produce a thousand times more than they really need of these yellow, orange,

green, red, black, or blue grains. A dog likes butter, but he will turn from it with loathing if that is all he has to eat. He would starve on it alone. So a bee loves honey, but while it is a force-making food as good as butter, the bee needs a flesh-forming food, which pollen is. The dust sticks in the fur with which the bee is covered, but most of it is gathered in the market-baskets it carries on its legs, which it packs full and scrapes out into the comb-cells when it gets back home.

When we speak of the bee sucking honey it must be understood that it is not quite the same thing as our sucking cider through a straw. If we had to go from molasses barrel to molasses barrel, our straw would soon clog up. We can throw it away, but the bee must keep her tongue. Some will tell you it is a tube. Don't you believe them. It is more like a trough, down which saliva runs to thin the gummy nectar. The bee practically laps honey as a cat laps milk, dabbling the hairy end here and there to sop up the tiny specks of sweet of which the flowers are often stingy. So fine is the stream sometimes that a one-pound section box represents six hundred miles of it.

I wish I might tell you about the bee's tongue, if you had the time to rejoice with me over its marvels; I wish we could study together the wonderful antennæ with which the bee smells and hears; the curious compound eyes, in each of whose sixty-three hundred facets one may see with a good microscope the perfect image of one's hand opening and shutting the fingers; its breathing tubes that ventilate its body; its stomach, with the pretty four-leaved valve; its wings, its feet—any one of the organs of its body which have been so marvelously fashioned out of jelly by the hands of Circumstance and Necessity. But I cannot. I shall have done well if I in-

flame in you a desire to know of these things for yourself first-hand, which is as much better than book-learning as sunlight is better than candlelight.

Besides honey and pollen, another thing the bees get from plants, but which the bee-master had just as soon they did not, is that clean-smelling glue called "propolis." When wild bees made their nests in bushes, hollow trees, and clefts of rock, it was bully stuff to keep the weather out and make rough places smooth, but it is an awful nuisance in the patent hive, and it gums the bee-keeper's fingers together. Alcohol will take away the gumminess, but not the greenish-yellow stain, which nothing seems to feaze. The bees get it from the glazed buds of certain trees, from the sticky stalks of sunflowers, and even from the house-painter's varnish can.

I do not know for how many thousands of years man has studied bees, but up to August, 1768, it was universally believed that beeswax was pollen chewed up into a paste. In that month and year a French peasant, name now lost, reported the exact truth about its manufacture to his local society of bee-keepers. And how do you suppose he made this great discovery? You'd never guess it in the world. He watched them make it, instead of trying to reason about it. Bees are telescopic animals, and in where one part slides into another he saw the scales of wax forming. If you feed chickens generously and shut them up in a dark, warm place they fatten quickly. Beeswax is not chemically a fat, but it is so near allied thereto that it is secreted under precisely the same conditions. The bees fill themselves as full of honey as they can hold, cluster in a bunch in the warmth and darkness of the hive, and in about five days the wax is sweated out in little plates. They take them out and chew them up to make them soft and pliable for comb-

building. Wax costs fifteen times its weight in honey, and the bees make it go as far as possible. One pound of beeswax will enclose about thirty-five thousand honey cells. To save them all the bother he can, the modern bee-keeper supplies his bees with the midrib or foundation, on each side of which they build cells about half an inch deep and about one-fifth of an inch in diameter. The foundations are sheets of wax run through rollers that stamp them with pyramidal indentations. One cell



Fig. 39. Drone-comb.

Worker-comb.

does not back square up against another. If you stick needles through the three facets that make the pyramidal indentation in the back of a cell, they will come out in three cells on the other side. That distributes the weight of the honey better.

One of the strange things about us human beings is that we cannot seem to get it into our heads that the truth is more delightful than any kind of a story that we can make up. Here is the bee making six-sided honey cells each one bottomed with three diamond-shaped facets. To fill a space with boxes that would fit together snugly the boxes would have to be triangles, squares, or hexagons. Of these the hexagon contains the most in proportion to the material used in making the box. The Romanticists (for there are Romanticists and Realists in science, as in everything else) are half a mind that the bees figured all this out themselves by their own wisdom,

and half a mind that they have no sense at all, but are pretty little automata wound up and set a-going at an angle of sixty degrees. If you will sit tight now and hold fast, I will try to show you how far advanced they would have to be in plane and solid geometry to lay off one of those three diamond-shaped facets that close the end of the six-sided cell. If we are going to be mathematical we might as well be hanged for an old sheep as killed for a young lamb, so we will call the diamond-shaped facet a rhomb, an equilateral parallelogram having oblique angles. Now, assuming that the comb equals its ideal form, to close up a cell each of the three rhombs must have its wide angle—I beg your pardon, obtuse, I should have said—must have its obtuse angle of such size that half of it has for its tangent the square root of 2. That quite clear to you? Some day, when you are not otherwise employed, you may spend a pleasant afternoon extracting the square root of 2. I will put it another way. The diagonals of each rhomb must be to each other as the side and the diagonal of a square. One can imagine the first bee that landed ciphering out this problem on the blackboard, thumbing over its book of logarithms till it finally set down: “Tan. square root of 2 equals 54 deg. 44 min. 8 sec.”; multiplying that by 2 to get the whole obtuse angle, 109 deg. 28 min. 16 sec.; subtracting that from 180 deg. to get the acute angle, which is 70 deg. 31 min. 44 sec., and then dusting the chalk off its clothes with a happy sigh and hunting up the scissors to cut out a pattern to fit a hexagon whose diameter is one-fifth of an inch.

But wait. There's more. Maraldi measured the angles of these rhombs and then gave the problem to Koenig to solve. Koenig's calculations for the pyramid

that would most economically end a hexagonal prism differed from Maraldi's measurements by 2 minutes of a degree. Worried about it, he worked until he found a printer's error in his table of logarithms that had led him astray by just so much. Whereupon Lord Brougham threw up his hands and clucked his astonishment that the hive-bee should have solved a most recondite mathematical problem so absolutely that it corrected a standard book of reference. And how wonderful the bee is, and what a lesson this should be to us, and so on and so on.

What nonsense! An error of 2 minutes in a degree! Maraldi was the one that made it, of course, for that means a divergence so small that two lines forming this angle would travel 144 feet before separating one inch. Listen. The wax in a comb is as thin as the bees working in it can scrape it without making holes in it. Blow a soap bubble. As it floats in the air it is a globe which has the greatest possible content in proportion to its envelope. Put it on a plate, and if it doesn't burst the bottom is flat. Surround it with six other bubbles. The equal tension of the meeting films will make the central bubble a hexagon, just as the equal tension of the thin wax with the bees working in it and pressing against each other makes it a hexagon. Oh, the marvelous geometry of the honey-bee! Oh, the profound mathematics of soapsuds!

If Lord Brougham had only used his eyes, he would have seen that the outer cells of the honeycomb are cylindrical, just as the outer bubbles of a mass of froth are globular. Besides, worker-cells and drone-cells are not of the same diameter, to say nothing of the pear-shaped queen cells, so a comb *couldn't* be mathematically exact. Almost every cell in a honeycomb is out of a true hexagon by at least three or four degrees. Falsehood, willful

or careless, always degrades that which it is intended to exalt. The bee is something vastly more worshipful than an automaton that goes on mechanically making hexagons world without end. It is a living organism

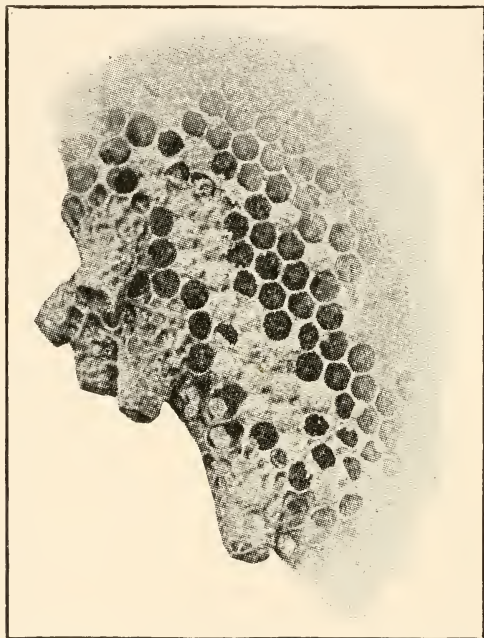


Fig. 40. Formation of queen cells, on an ordinary comb.

whose tiniest cell is all instinct with Mind—Mind, that differs in degree only from that of the Almighty God Himself, in whom we live and move and have our being. He has made us all, from the jellyfish to the philosopher, “of one blood for to dwell on all the face of the earth,” and the bee is like us except that, instead of the individual living a long time and learning as he grows, it is the race

that gathers wisdom, changing form and habit of existence to fit environment.

It is as certain as anything can be that at one time the bee was simply male and female. The irresponsible male buzzed about getting his own living, marrying and dying. The responsible female not only got her own living, but that of her children. Somehow, they came to see the advantage of communal effort, and, just as women say now, "If you'll wash the dishes, I'll wipe 'em," one female bee said to the others, "I'll be the mother, if you'll get the living." It was a bargain, and they took the drones to board. Somebody had to look out for them. The queen of a beehive does not rule; she lays eggs. She does not mind the babies. She does not even do her own digesting, let alone getting the food. The attendants that surround her are not continually bowing and scraping and saying, "Your Majesty"; they are feeding her with bee-milk, secreted by glands in their heads. It is like the chyle poured into our blood, food so perfect that the queen does not need to leave the hive from time to time to keep it clean and sweet. She has to be fed continually, for at certain periods she has the power of producing from 2000 to 3000 eggs a day—twice her own weight—four times, indeed, for more than half her weight is eggs. In her lifetime a very prolific queen will lay 1,500,000 eggs. Put each of these little grains, one-fourteenth of an inch long, end to end, and they will make a line of a mile and three-quarters.

She possesses the power of choosing which of her offspring shall be drones and which workers. Some have thought that this was automatic, and that the narrower worker cell touched the button, so to speak, that brought forth a fertilized egg. But the queen will lay worker eggs in drone cells if she thinks fit, so that settles that.

If the drone is male and the queen female, what is the worker? The New Woman of Bee-dom. She has given up her motherhood for a business career. Sometimes, though, she lays eggs, but they always hatch out drones, of whom it is strictly true to say, They have a mother, but no father. If the queen's wings are crippled so that she cannot make her marriage-flight, her children are all drones. An Italian queen in a hive of black bees will beget workers of mixed blood, but her sons are pure Italians. Drones are useful as fathers of workers, but

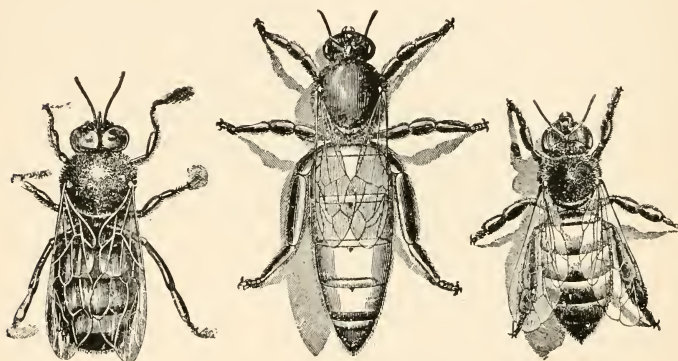


Fig. 41. Drone.

Queen.

Worker.

they cannot collect the honey they eat. Their tongues are too short.

The worm, when it hatches out of the egg, lies in its cell surrounded by bee-milk, or "royal jelly," as it is called. As it grows in size and strength it is weaned, so to speak, by having the milk diluted more and more with pap made of pollen, honey, and water, till it finally lives on grown-bee diet. If the worker is not weaned, if it lives on the fat of the land till it spins its cocoon, it will be a queen. I don't know how it would do to put little

girls on a low diet to make New Women out of them. It is an experiment worth trying—on somebody else's little girl. Not mine. Not mine.

What marvelous, what miraculous transformations occur in the progress from that tiny pearly egg, covered with a fine net like the stuff the women folks call "blonde"; through the blind and legless grub that soaks its food in as well as eats it; through the chrysalis that lies tranced while the swellings on its shoulders change into a double pair of gauzy wings and that ridge upon its breast is metamorphosed into an ingenious tongue, while the interior organs undergo profound mutations, each step of which traces back through millions upon millions of contributing ancestors——

Ah! we are too ignorant, too dull, and stupid to understand!

But of one thing in this preliminary life I should like to tell, if I might. All of us, from the fishworm to man, are tubes. The white of the egg from which we came pits at either end toward the central yolk, which leaves a hollow that becomes the alimentary tract. Now, the bee is the cleanest of mortals. We say, "As neat as wax," and that is what a beehive is. How to keep it so when there are helpless babies in the brood-comb is a problem solved in a most original manner. In the bee-egg only the front dimple imperforates into the yolk and the bee-grub has only a mouth. It eats, but its dejectamenta remain impacted in the bowel until the time comes for the transformation sleep. The grub slowly turns end for end in its narrow house until its head is toward the back wall. Then it casts up its interior skin, with all its contents, and rams it into the pit formed by the three rhombs. When its outer coat slips off it, too, is rammed on top the inner skin till all is sealed up air-tight and devoid of

offense. Then the grub turns to its former position, spins its cocoon and sleeps. When it cuts its crescentic door in the capping of its cell and crawls forth, a gray and staggering thing, but a grown bee, it must be flying in the air to discharge its bowel contents.

Drones are brought forth in large numbers—too large, it would seem, since a colony with six or eight thousand drones will perhaps rear no more than two queens that mate but once in their lives. But it is necessary that the queen shall certainly meet a strong-winged lover when she flies forth. Her embrace is fatal to him. As for the other idlers and Alphonses, they are killed off when summer roses fade. The workers come back to the hive almost empty.

“My!” puffs one bee. “I’m about tuckered. Hunted high and low and look what a little dab I got.”

“Me, too,” answers another. “In all my life, and I’m nearly four weeks old, I never saw times so hard and honey so scarce. Here, you! Get out of the way till I put my honey in that cell.”

The drone takes his time about moving.

“Why’n’t you get your own honey?” snaps the worker.

“Huh?” grunts the drone stupidly, wiping his mouth.

“Why’n’t you get your own honey? Lazy, good-for-nothing thing! Us poor girls has to slave early and late just to feed you, you loafer.”

“A-a-a-ah, go chase yourself! You’re too fresh!” snarls the drone, shambling away.

“What’s that? Did you hear what he said to me? Well, of all things! For half a cent I’d—I will, too. Get, now! Clear out o’ this!”

“Got as much right here as you have,” growls the drone.

"You have, eh? Well, I'll show you just how much right you have here. Come on, girls! 'Raus mit ihm!'"

The crowd gathers, angry and resentful. They seize the luckless drone by the coat collar and hustle him. The cry, "'Raus mit ihm!" becomes general.

"Don't be afraid of 'em. They can't sting. Lazy loafers! They'd eat us out o' house and home. There goes one! Head him off, somebody! Catch him!"

The fanners, on duty at the door, clutching the floor with their claws and working their wings as if flying, thus making the air as sweet and pure inside as out, look up from their work and grin. "Serves 'em right," they say, "'Raus mit 'em!"

"Quit, now! Quit, I tell you!" the drones bawl. "I didn't do nothin'!"

That makes the workers laugh. "That's no lie," they chuckle. "'Raus mit 'em!"

The ejected drones coax the doorkeepers to let them back. "You know me. Let me in, won't you? Aw, now, I think you might."

"Nup," say the sentinels. "Can't do it. Orders, you know. Move on, now, or I'll——"

The chill night kills them, and the toads about the hives lay on fat for winter. Sometimes if the weather warms up and the honey flows again the drones get back, but as soon as expenditure exceeds income out they go for good and all.

When human society, now so imperfectly adjusted, shall have become as completely organized as that of the bees, is this to be the fate of us men-folks? Let us be thankful that we live in these times, troublous though they be!

When I was a little boy and went to visit my grandfather on the farm it made me feel sorry and guilty to

know that, for the honey that came on the table in a big, brownish mass, the poor bees that had worked so hard had not only been robbed, but murdered also with sulphur fumes. The neat and pretty one-pound section frames on our tables to-day represent a politer fashion, that of "benevolent assimilation." A gentler practice has given us whiter honey and almost complete control of swarming, once such a care to the bee-master. I can remember going past Mr. Cochran's house one morning, on my way to Sunday-school, and watching that ruling elder in the Presbyterian church struggle with the determination not to lose his swarm and the shame of publicly breaking the Sabbath with a dishpan and a mush paddle, while his pious wife tooted a fish-horn.

"Consarn 'em!"—I can hear him say it now—"Consarn 'em! No other day 'ud suit 'em to swarm on!"

The plagued things had a way of settling on the elm-tree, too far up to reach by standing on a chair, and awkward to get at with a ladder because of the back fence. Probably a queen had once alighted on that bough and her perfume, not to be removed by wind and weather, had attracted them. Honey bees will cluster on the fingers that had held a queen, even on the knife that has dissected her.

Some say it is of no use to make a noise; the bees can't hear you. I don't know about that. If they can't hear, why do they buzz? Why does the drone hum? Why do the rival queens go, "Zeet, zeet, zeet," at each other? Who would "holler" if nobody heeded? Anyhow, this fish-horn, dishpan, and mush paddle racket serves one good purpose. It lets folks know whose swarm it is.

Smart bee-masters by throwing water on the swarm and various other little cunning devices can scoop up thousands of bees together as if they were so many seeds.

But the cleverest trick of all is one that an old clergyman in the State of Wyoming invented. Along about the time his stocks began to get the fidgets he would pick up dead bees and string them as one strings worms for eel-bobs. When he got a bunch about as big as a hen-egg, he left a few strands hanging loose and fastened it up in a conspicuous place. When a swarm came boiling out it would "follow the crowd," as it thought, alight on this "bee-bob," and he would gather them in before they got off the premises.

Bees swarm when they think there is enough brood coming on to populate the hive after they leave. In the old straw skep that artists will draw you for a hive, though they never saw one in their lives, broodcomb and honeycomb were all in the one inclosure, and the bees had to be murdered or smoked out before the honey could be got. But nowadays there is an upstairs to the hive, where the bee-master puts the comb as fast as it is made. The queen never goes up there to lay eggs, and the bees stock the frames with honey. The bee-master sees to it that the brood is kept up, for in the busy season workers are old and worn out in six weeks, and they have many foes.

If he robs them, he also feeds them. When there is

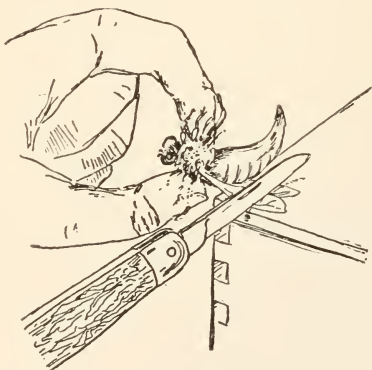


Fig. 42. How to clip a queen's wings with a dull pocket-knife.

no pollen he gives them pea-flour. They roll and tumble in it, and have a good time. If he isn't careful, they will get too lazy to hunt for flower-pollen. Syrup he supplies them in a feeding-bottle. Bees are fond of milk boiled with sugar, and do well on it. The worst of it is they store it in their combs. It sours there, and they won't take it out. They thrive on eggs beaten up with sugar, too.

Before cane sugar became common—it was just coming in when Shakspeare wrote—honey was about all the sweet our ancestors had. Nowadays honey is a table delicacy, a food of the first order of merit. Cane sugar introduced directly into the blood is a poison. It must be changed into grape sugar by the fluids of our mouths. The cane sugar of flower nectar is already transformed by the bee, and, as honey, is easy of digestion. But not the wax. There is gold in sea water, but as far as our getting it is concerned it might as well not be there. The treasure of 63,894,186 pounds of honey produced annually in the United States alone were equally inaccessible to us, but for the labors of countless thousands of hive-bees that gathered it “from every opening flower.” For each 1-20,000th of a pound a separate journey two or three miles in length had to be made by the winged worker.

If we admire the honey bee above all other insects, it is because our interests have prompted us to know more of it than the rest. To look only a little way into the mystery of any living thing is to stand upon the brink of an infinity, inwardly as deep as that which looms above us outwardly, circling the farthest marches of the shining stars. The soul sinks upon her knees at thought of it. Not the bee alone, but every flying midge—yes, every cell of protoplasm—is embodied Mind working before us

momently the miracle of Life. Some speak of Matter with a lofty scorn. I don't know why. It was good enough for God to make the world of, and I believe that the devoutest soul can say with Tyndall: It contains within itself the power and potency of all life.

Why play with occultism and its jingling trumpery while mysteries of such magnificence buzz on our windowpanes?

CHAPTER XIII.

THE LAST WORD.

GENTLE reader, we are come to the last chapter. Here, by good rights, the Hero should triumph over all his enemies, the Heroine should pillow her head on his manly bosom and, rolling up her large, lustrous orbs, exclaim: "Dear John, I loved you from the very first!" The property should now be theirs after all, and the Wicked Villain should go out gritting his teeth and clinking his handcuffs. However, this is not that kind of a book, as doubtless you have discovered ere now. Still, I hope you have found it quite as interesting as the other kind. It may be that you have even found it instructive, but I would take it kindly of you not to say anything about that to your friends. Many people have a horror of being instructed, and if it should get out that this book was filled with useful information, it would kill its sale deader than a door-nail. Perhaps I ought not to speak of such matters, and I wouldn't to everybody, but I feel so well acquainted with you that I don't mind telling you that we have planned a good deal as to how we should spend all the money that this book will make. There is, of course, the trip to Europe, though, in a pinch, that can go over till next summer, as it has been doing ever since we were married. But we really do need a new dining-room set. I might build that house I have been cutting out plans for these many years, and at the very least calculation I think I ought to get a new pair of

shoes out of all this. So please don't say it is an instructive book and one well calculated to improve the mind.

Confidentially, and between you and me and the gatepost, I think it is. It would have been more so if I had not wandered hither and yon over the whole landscape, blazing away at every topic that flew up out of the grass. Somehow I can't stick to my text worth a cent. I suppose I really ought to take all the blame for it myself, but I hate to do that as long as I can conveniently lay it on the system of education prevalent when I was a boy—and now too, for that matter. Instead of taking one study and working away at it till it was done, I got a little dab of arithmetic and a spoonful of geography and a crumb of grammar and a morsel of spelling, and once a week a homeopathic globule of music. It was just as if you were keeping six or eight novels going at once, leaving off one at: "But at this moment what was Irene's horror to discover—— Take the next four pages for to-morrow," and going on with: "It was a calm, still evening in that rarest of all months—the month of June, when Lady Hildegarde——" and so on until all the characters were in a hopeless muddle in your mind, and you had to read some little time before you could remember whether it was Irene or Lady Hildegarde that was in love with Eustace Tremaine. Almost anybody would have more sense than to attempt such a thing with novels, but the insanity of any method is just what is its strong point with educators. As soon as a child's mind gets really to going on arithmetic they must shut off steam and put on the brakes and make another start on geography, only to fetch up with a jerk there that loosens all the fittings. The children must have variety. Nonsense! Desire for change is almost exclusively an adult

hankering. We cannot endure to hear a story told twice, but that is exactly what a child wants, and not twice only, but over and over again, word for word and intonation for intonation.

I feel sure that children would make far more progress taking up one study after another and keeping to each until the book was finished than they do now. It is this skipping about from one thing to another and hallooing "Whoa!" in almost the same breath as "Geet ep there!" that plays hob with our powers of concentration and keeps us from sticking at anything until we conquer it. See what our system of education has brought me to. Let that be a lesson to you.

Yes, sir, I fully intended as much as anything could be to write a whole chapter on Locusts, Grasshoppers, and Crickets. I had another planned on the Colorado potato-beetle, showing that it could cipher as far as decimals, because it has ten stripes on its back. I was going to write another chapter on Guerrillas of the Garden, which I have been assured by a very competent authority is an extremely taking title, and you know that if you have a nice front stoop to your house it is half the battle. In this chapter I was going to stretch a point and bring in the enemies of shade-trees, and the way they put tents over orange-trees and kill off the San José scale by generating hydrocyanic acid, a gas that will kill you as quick as wink if you get a good whiff of it. But while there are a good many words in a book, it has its respectable limits, and I had to stop sometime.

You can see for yourself, though, what a chance I had in that Grasshopper chapter. When I say grasshopper, I do not mean the grasshopper that you mean, which is the locust, and the locust that you mean is the seventeen-year locust, which is a bug, and not a locust. It is a

cicada, and when an artist makes a picture of a cicada to illustrate La Fontaine's Fables he draws a grasshopper. So you see, it is a kind of pussy-wants-a-corner nomenclature, but you will know what I mean when I say that the locust is the creature that when we were little boys we were always going to hitch up with thread to a paper wagon, but never could quite manage it. I don't know why it is that it is the ambition of every little boy to have such a team, when he knows that they will kick over the traces in a manner to shame the wildest colt, unless it is that the locust's head looks something like that of a horse with blinkers on. Do you remember how we used to make them spit tobacco juice? It was the locust first taught me that insects' jaws work sidewise. It is a primitive insect, much akin to cockroaches, and, like them, having practically no metamorphoses.

I was going to say something too about what a plague these locusts or 'hoppers were in the early seventies to the States just west of the Mississippi. They fairly skinned the earth of every green thing. Farmers went mad in droves, driven insane by the horrid noise and the impending ruin it foreboded. The governors of Minnesota, Dakota, Nebraska, Iowa, Kansas, and Missouri met at Omaha to talk the matter over. Strange to say, that did no good, though they were most able politicians. However, it was decided there to name April 26, 1877, as a day of public humiliation and prayer, that the Maker of locusts and of men would discriminate against the locusts and in favor of the men.

It was unusually warm weather when April 26 drew near, and the 'hoppers hatched early and started out for a vigorous campaign, when lo and behold you! a terrible cold wave came and killed them off so thoroughly that there have been hardly any to speak of since. The folks

that believed in the efficacy of prayer said to those that didn't, "Aha! What did I tell you?" and the folks that didn't said to those that did, "Oh, well, it was due to natural causes, you can't deny that. It was merely a coincidence." Some people are perfectly unreasonable.

I was going to say a few words about one clever New England farmer that couldn't bear to see the 'hoppers eat up his hay and he get no good of it, so he rigged up a sort of seine and hauled it over his meadows, gathering in the creatures by the bushel. He boiled them and fed them to the chickens, and they liked the stuff so well they got too fat and wouldn't lay. Young turkeys are said to get most of their living from locusts. The Arabs like the things boiled in oil. And that reminds me of a story I always like to tell.

There is a congregation of nuns in the Episcopal Church, a branch of what are called the "Clewer Sisters" in England. The mother house in New York City has a summer home up in the Catskills. A stranger to the neighborhood, driving along the road with a native, turned to look at the, to him, oddly attired women, walking two-by-two in wimple, hood, and flowing veil.

"What fer kind o' folks d'ye call them?" he asked.

"Them? Why, them's the Sisters of St. John Baptist. They live up the road a piece."

"Get out! You can't string me that way. John the Baptist's ben dead more'n a hundred years, him and his hull connection."

Speaking about eating locusts made me think of this.

The Colorado potato-beetle was a pest as much feared as the 'hoppers at one time, but nobody bothers much about them now, even though they have left their first love to an extent and will eat almost any kind of "garden sass." About the only creature that cares to eat this in-

sect (I believe no saint has tried them yet) is the quail. Unfortunately, the extremely reasonable price of shot-guns forbids the coincidence of quail and potato-patches to any marked degree. These bugs, aside from affording a convenient employ for children that would otherwise fool away their time in playing and so gaining strength for the battle of life, have done a great work. They introduced us to Paris green, a valuable insecticide and one that is perfectly safe for us, since it is not soluble in water and it takes as much bigger a dose to kill a man as a man is bigger than a potato-bug. Another arsenical preparation, London purple, does about as well. And that recalls another story that I meant to put in the chapter. An entomologist was traveling up the Mississippi on a river steamer when his attention was called to the ice cream by the admiring plaudits of his fellow-passengers, who had never before beheld anything so pretty. Come to find out, the chef, a true artist in his line, had seen some London purple sifting out of the bags in the cargo and had scraped it up to color the ice cream, and here this entomologist had to go and spoil everything by telling the people that it had arsenic in it.

I have not thought out exactly what I was going to say in the chapter on the Guerrillas of the Garden. There would have been a lot of matter, and even if it had not been very interesting or full of pretty pictures, I am satisfied that the chapter heading would have carried it off all right. People don't mind what is in a book so long as it has a nice title and She gets Him.

But though this is not the kind of a book where She gets Him, in this last chapter I have managed, in spite of my proneness for divagation, to do the next best thing. It is not enough for the author to dispose of the fates of the Hero, Heroine, and Wicked Villain. He must also

do something for the minor characters, thus: "As for our friends, Harry and Frank, they are still plodding along in their uneventful career as humble aëronauts"; or "Little Boy Blue is now employed as a copy-reader on a great metropolitan daily, and often recalls the happy days when," etc., etc., summing up whole lives in one sentence. So also in this chapter I have compressed into a few words the mention of insects that really should have been spread out over many pages.

However I may have wandered about, to one idea I have stuck, though perhaps I have not made it as plain as I might, and that is, the essential oneness of the whole visible universe. There is not much of it I can understand, and it may be that I do not understand that aright, and yet it seems to me that, as it were, through a glass darkly, I catch some glimpse of thoughtful organization. I will not say "plan," for that is a belittling word. One plans that barely can accomplish what he sets out to do, and must scheme and contrive or fail completely, a species of Atheism I have no stomach for. Then, too, if a plan is discernible at all, it is by the end the planner would achieve. To what purpose is this world made? Who can tell? Some there are can say the answer off the book. I should like to be a little surer that they really know. They seem to me to be at fault in that they assume that one animal, relatively scarce, of few varieties and but a single species, is wholly set apart from the innumerable myriads of other moving things instinct with life. Body and soul, they say, he is so wonderful a piece of work it were too great a pity to be true that he should not endure through all the ages, long after the sun itself has chilled to a cold cinder in the sky, while these others perish and are no more seen. And yet the bodies of these others are not less admirably

formed that I can see, nor are they actuated in such wise that one may surely say "It is not Mind that moves them from within." What difference there is, it seems to me, is in degree, and not in kind, and if they think on such matters, doubtless they are quite certain that the world exists for their behoof and not at all for ours. If so, they show their likeness to the folk that prayed the locusts from the earth they had no business on. This may seem to some irreverent, but it is hardly a match for the brazen impiety of those that tacitly declared that God had grown old and forgetful, and needed to be reminded from time to time of what his duties were.

I am no critic of the universe. So far as I can comprehend, it seems to me to be quite sensible. It is not a pretty, ice-cream soda, sentimentalistic sort of place at all, but one where everything must get a living somehow. The insects that earn it honestly, whose products we can use, seem to us praiseworthy. Those that live by murder and rapine we fear unless they kill our foes. Then we bless them. Those that deadhead their way, the parasites, we detest and loathe, and yet it must be that in the larger view of Him that made them, there is neither praise nor blame, loving nor loathing. What operates in our minds and makes us call one action good and another bad is an impulse that makes as surely for the preservation of the race as that which prompts the wasp to tweak the stung and palsied caterpillar's hair to see if life still lingers. Truly, oh, truly, is it written, "As righteousness tendeth to life: so he that pursueth evil pursueth it to his own death."

But though the creatures I have here written of are not to be to us an ensample of godly living, yet the study of them cannot but make for our betterment in body and in mind. If we are to make this world a place to live in it

must needs be that we should know it thoroughly, who are our friends and who our foes, and by what devices we can play the one against the other. Thus shall the earth bring forth her increase and there be plenty in our barns. Also, if we consider carefully these most marvelous beings that throng us all about, we shall not be so likely to bemuddle our brains with little home-brewed mysteries, spirits of great men come back to chatter foolishness; Adept Brethren in the Himalayas that precipitate tea-sets in Ceylon jungles; much-married harridans that cure a cough by declaring that there is no cough, no lungs, no air, no anything but Mind, and apparently very little of that—in short, if we are interested in Bugs we shall care not at all for Humbugs.

THE END.

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